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VIEWS, NEWS AND INTERVIEWS.

Fred. Barton, night clerk at the Victoria Hotel; William Willard, an employé of the Citizens' Electric Light Company; Ed. Cameron, a Western Union lineman; B. Richardson, a telegraph operator, and W. W. Snyder, whose occupation is not stated, are in jail at Louisville, Ky., under a charge of wire-tapping.

Mr. George Gould is quoted as saying: "I hear that a new telegraph company, in opposition to Western Union, is to be started. The undertaking is a big one, as the Western Union system could not be duplicated for cash for the amount of its capital stock. Earnings keep increasing $10,000 a week."

The meeting of the electricians at Workman's Hall, in Cincinnati last week, was poorly attended, and resulted only in an informal talk between the men. It was decided to call another meeting with the same object in view. The cause of this agitation among the members of the electrical fraternity is the discharge of the employés of the Edison Company, as the men claim, without cause. It is asserted that the men intend to fully test the validity of the law regulating such discharges.

The Central and South American Telegraph Company, through its president, Mr. James A. Scrymser, notified the officers of the Argentine and Brazilian warships lying in the harbor of this city, that on April 30 and May 7 the company would forward free of charge any dispatches they wished to send to Brazil or Argentina.

During the telegraphers' strike on the Rock Island road the superintendent of telegraphs worked a very clever dodge on the strikers. Loading a special train with plug operators, clerks and messenger boys from his office and their friends, he went out on the road, and whenever he came to a station where there was a striking operator, he showed him the array of alleged operators ready to take his place, and then inquired whether or not he wanted to be replaced. In the face of these apparent odds the operator generally concluded to keep his place, and the superintendent would pat him encouragingly on the back, and the train would go on to the next station.

At St. John's College, Oxford, England, an effective means has been discovered for protecting delicate instruments from magnetic influence in their vicinity. In putting some electrical machinery in this college, a seven ton transformer of the dynamo-motor type had to be placed within 60 feet of the testing room, which is furnished with several reflecting galvanometers. To protect the instruments from the influence of the magnetic field of the transformer, one of the professors hit on the idea of a wall of scrap iron. This idea was carried out by building two brick walls about eight inches apart around three sides of the dynamo nearest the laboratory. The space between the walls was then filled with the scrap iron. Tests made with a delicate magnetometer showed that the scrap iron wall was an effective barrier to the magnetism.

A European dentist is said to have had great success in curing toothache within five or six minutes, and often in less time, by applying one pole of an electrostatic machine to the troublesome tooth, and the other pole to the body of the patient. In 76 cases thus treated by him only three are said to have been unsatisfactory.

The telephone company of New Haven, Conn., has a railroad bicycle so arranged that two men with their tools can place the bicycle on the railroad track and quickly reach any point on the line where their services are needed.

The Western Union did some good work during the rendezvous at Old Point. It is calculated that they sent off between 550,000 and 600,000 words of press matter, besides several thousand private telegrams. The company has two regular wires from Old Point, but on this occasion they supplemented these by borrowing one railroad wire from the Chesapeake and Ohio, and a telephone wire, and then building a nine-mile connection. They also turned the local operator's bedroom into an operating room. To handle the immense volume of matter which poured into the office, Superintendent Tree detailed the following knights of the key who are not only rushers in the matter of sending, but can read any copy brought in to them: Chief Operator Hall, of Norfolk; Chief Operator T. D. Cudlipp, of Richmond, quadruplex chief of Richmond, and Operators C. W. White, and R. E. Hotze, of Richmond, Fisher, Boggs and Ingling, of Washington, and Echard, of Lynchburg.

Some capitalists from Troy, N. Y., are looking for a small steamer suitable to run on the Hudson river between Stillwater and Schuylerville in connection with the electric railroad from Mechanicsville, which will soon be changed from horse to motor power.

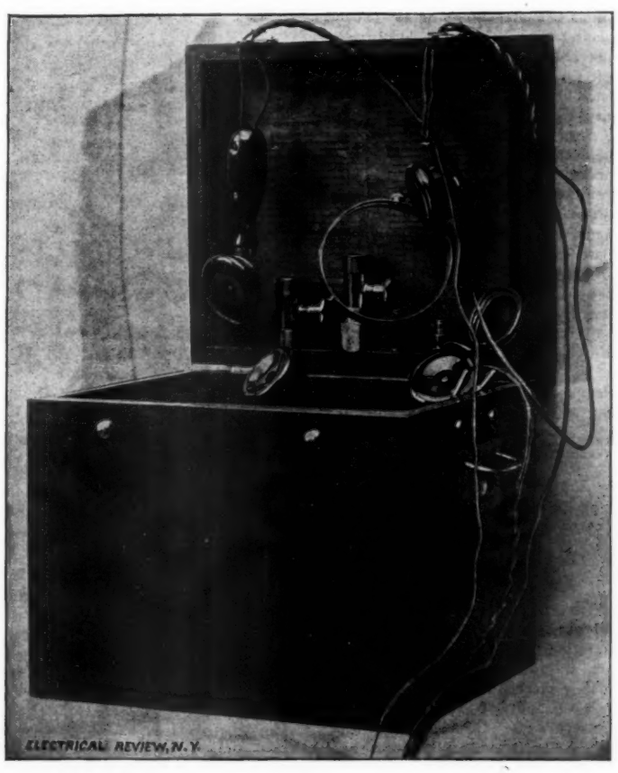

FIG. 1.—DIVER'S TELEPHONE APPARATUS.—MADE BY THE AMERICAN BELL TELEPHONE COMPANY.

Telephone Apparatus for Divers.

In the accompanying engravings is illustrated a system of apparatus by which telephonic communication may be held with divers. Apparatus operating on the magneto principle can be used for this class of service, but difficulty has been experienced in doing so. The plan pursued by Mr. H. V. Hayes, whose system has been applied on several of the United States cruisers, and which is being supplied by the American Bell Telephone Company for use in other places, comprises a Hunnings transmitter combined with a receiver wound with a low resistance coil suitable for a battery current. An insulated wire connecting with one terminal of the battery is carried through a break key mounted on the outfit of the person stationed above the water, which outfit is carried on a hook in a belt worn by such person. The circuit then leads through a low resistance receiver and a Hunnings transmitter comprising two electrodes, between which is granulated carbon, and thence to a receiver and transmitter contained within the hood worn by the diver. Another uninsulated wire wound around the insulated one extends from the other pole of the battery into the water, or in some cases to the metallic portion of the diver's bell. By means of the break key the operator above the water can control the conversation. When the diver wishes to speak he pulls on the life line and notifies the operator above the water, who then presses the key and puts the circuit in condition for communication. In Fig. 2 is shown the outfit worn by the operator above the water, and in Fig. 3 a diagram of the circuit connections. (See page 154.)

The set of apparatus illustrated and described herewith has been prepared for exhibition in the booth of the American Bell Telephone Company at the World's Fair.

FINANCIAL.

It is officially denied in Boston that the General Electric Company contemplates any stock issue.

It is understood that the General Electric Company may issue within about a month a "Series E," to represent about $1,000,000 of accumulated securities.

The Old Colony Trust Company, of Boston, took possession of the Allen & Sweeney electric light and railway plant, of Dubuque, Ia. The General Electric Company, of Boston, will participate in the reorganization.

The annual meeting of the stockholders of the Westinghouse Electric and Manufacturing Company will be held in Pittsburgh, May 17, at 10 A. M. The transfer books will close May 8 and reopen May 18.

The net earnings per revenue car mile of the West End Street Railway Company, of Boston, for the six months ending March 31, 1893, were 9.02 cents. The earnings per electric car mile were 12.29 cents and per horse car mile 1.56 cents.

The Use of Accumulators in Telephony.

The January meeting of the *Elektrotechnische Verein* is of special interest to telephone engineers as, among other important matters, the use of accumulators in telephony was fully discussed, with special reference to those constructed by Messrs. Boese and Lutcke. The discussion elicited a number of novel and valuable points. It was stated that these accumulators had been carefully tested by the staff of the telegraph administration and from their official reports it appears that the new secondary battery has a charging capacity of 62 A per kilogram of plate weight. In consequence of these rather remarkable results the postal administration entered into an agreement with the manufacturers by which they are to replace the two Leclanche elements (which are at present furnished to each telephone subscriber with his transmitter), with a single secondary cell having a 100 ampere hour capacity.

Furthermore the administration intends to employ these accumulators in place of their present telegraph batteries and has installed a number of such secondary cells in the main telegraph office at Wilhelmshaven.

It is also stated that the accumulator once fully charged retains the charge for a long time, so that the cell need not be exchanged, except once in nine months.

The accumulator used for telephonic apparatus is somewhat larger than that employed for telegraphic purposes. It consists of a glass jar with two positive and three negative plates, each made of a peculiar metallic compound containing lead, together with several other chemical materials. Both positive and negative electrodes are exactly alike and carry a leaden band serving as the connecting strip.

The administration assumes that a microphone with three carbon cylinders requires a current of 400 m. a. for each conversation. The official statistics show that in 1891 there were 61,914 subscriber's stations, necessitating 262,520,399 connections, *i. e.*, each station (figuring on 300 working days), averaged 14 connections daily.

Assuming further that a complete telephone conversation consumes four minutes, or that each subscriber uses his microphone for 56 minutes per day, the current needed is as follows:

$$\tfrac{56}{60} \times \tfrac{4}{10} = \tfrac{56}{150} \text{ ampere hours.}$$

But as the accumulator is required to furnish sufficient current for nine months, or 270 days, its capacity should be:

$$270 \times 56 : 150 = 100 \text{ ampere hours.}$$

The price of the accumulator manufactured by Boese & Lutcke is 13 marks, which, taking into account five per cent. for interest charges and five per cent. for depreciation, necessitates an expense of 1.30 marks. The recharging of the battery (charging 40 at a time), costs 20 pfennige, and to this may be added 50 pfennige per element to defray the expense connected with their exchange. Consequently the total expense would be:

$$\frac{130 \times 9}{12} + 20 + 50 = 168 \text{ pfennige.}$$

Omitting the first cost of installing two Leclanche elements, the expense incurred in their exchange (and an exchange should be made once in six weeks according to the rules of the department) figured for 270 working days, is

$$6 : 48 = 8 \times 50 = 4 \text{ marks.}$$

But in addition to this financial advantageous showing, inherent in the use of secondary batteries in telephony, the use of such elements considerably improves the quality of reproduced sounds. This well known fact is the result of the constant current of the accumulator, while that furnished by a Leclanche rapidly falls off in actual operation. Frequent tests have demonstrated that the initial electromotive force of a Lechanche (1.5 volts), rapidly goes down to 1 or 1.2 volts during a conversation, and this electromotive force through a resistance of 2.5 ohms in the primary circuit represents a current of but 400 m. a. On the other hand, an accumulator with 2 or 2.5 volts electromotive force produces through an equal resistance a current of 800 m. a.

Now, as the new source of current must furnish 400 m. a., at least, for nine consecutive months, it will be necessary to increase either the resistance in the primary circuit or the capacity of the cell. However, as the weight of the Boese accumulator is very light, it will not be difficult to accomplish this.

For the telephone engineer the fact that a large current circulates through the primary is of the greatest consequence, because the slightest variation in that current produces a very pronounced change in the induced current, and as the loudness of reproduced sounds depends largely upon the extent of the excursion of the diaphragm, *i. e.*, its amplitude of vibration, which in its turn depends on the exciting current, this advantage is of prime importance.

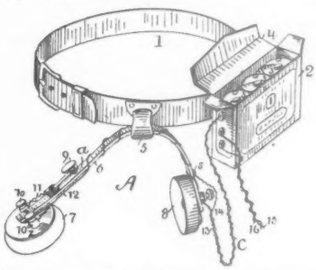

FIG. 2.—DIVER'S TELEPHONE OUTFIT, WORN BY OPERATOR ABOVE THE WATER.

Electric Lighting in South Africa.

It rarely happens that gas or electric light companies are unable to meet the demands made upon them for artificial illumination. Of course, in the case of the sudden descent of a thick fog, prevailing for say two or three days, or in newly populated districts, it is not always possible to cope with the demand for light at the commencement Johannesburg may be classed in the latter category. A concession for lighting this town both by gas and electricity was acquired about a year and a-half ago by the Johannesburg Lighting Company, which is an English concern with offices also in London. The supply of electricity was first commenced in April, last year, and of gas in June last. Thus, as the preliminary plant has not long been in operation, great progress has not yet taken place. The present company in 1891 bought up the late gas company which had not started work, and on the arrival of the managing director, Mr. Lance, in December of that year, the only electric plant then erected was a dynamo for running 10 arc lamps for street illumination. Mr. Lance states that there is a distinct preference shown locally for the electric light. The electric plant at present erected and in working order comprises the following: Two 86 horse-power Babcock and Wilcox boilers, two 25 horse-power (nominal) engines, one 45 unit Elwell-Parker alternator, one 30 unit of the same type, one 10 unit Tyne alternator and a 10 arc light Brush dynamo. In addition to these, there are, of course, exciters, transformers and station fittings, and three and a-half miles of mains are laid in the streets. This plant is running successfully and is supplying nearly 2,000 lights of eight candle-power, with reserve in case of accident. It is noteworthy that the demand for the electric light has hitherto been considerably in excess of what the company has been able to supply, and in order to meet requirements, additional plants for 1,500 lamps were to be started last month. Not only this, but proposals for further extensions, absolutely necessary to keep pace with requirements, have been submitted for consideration. The sole rights of lighting neighboring localities have been acquired. Two remarkable facts are that the coal used, which costs £3 per ton, has to be transported by bullock wagons from Olifant's river, about 70 miles from Johannesburg, and that the price of gas has been reduced from 20*s.* per thousand cubic feet to 15*s.* per thousand. It is intended to proceed at once with the extensions in electric lighting, which is, as Mr. Lance states, "undoubtedly the popular light in Johannesburg at the present time."

WORLD'S FAIR NOTES.

The exhibition space in the electrical building has been assigned to exhibitors, the allotments to foreign countries being as follows: Germany, 23,000 square feet; Italy, 1,000; Austria, 1,000; Canada, 500; New South Wales, 616; Russia, 200. The balance of the space in this department has been assigned to American exhibitors, and to two exhibits not electrical in character—viz., 3,800 square feet for a collective French exhibit of pianos, and 500 square feet for a collective exhibit from the principality of Monaco.

This department exhibit, when completed, will be fully up to the expectation of those who have been in touch with the work since its organization. Every conceivable application of electricity has been provided for. Operative exhibits in the several directions of electrical work have been provided. Many unique things in electricity will be included in the exhibit, and spectacular features of the most attractive designs are in course of preparation.

So far as the electrical equipment of the building is concerned it has been organized on a plan entirely different from that followed in other parts of the exposition. The building has been divided into sections and allotted to several large companies, whose business leads them in the direction of the supply of light, heat and power. These companies, operating from the plant in Machinery Hall, will not only furnish light, heat, power and signals to their space in the building, but will also furnish service of an electrical character to other exhibitors occupying space in the territory to which they have been assigned. The building has thus been equipped practically without cost to the exposition.

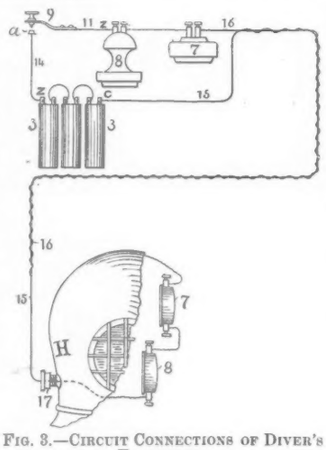

FIG. 3.—CIRCUIT CONNECTIONS OF DIVER'S TELEPHONE.

More than $16,000,000 has been paid out thus far by the Exposition Company alone in preparation of the Fair. An expenditure of six or seven millions more will be made.

Tjeldie, the Norwegian sculptor, of Minneapolis, will represent Hiawatha bearing Minnehaha in his arms across wild and rushing rivers. This is to be in the form of a statue for the Minnesota building at the World's Fair. Mrs. H. T. Brown, of Minneapolis, one of the lady managers for the State, has been particularly active in the enterprise.

The statue of Germania, which is to adorn the imperial portal of a new German Parliament building in Berlin, will be shown at the World's Fair. Through the efforts of Herr Wermuth and the consent of Emperor William this masterpiece of German sculpture will be exhibited at Chicago. It will be placed in the Manufactures building, as the crowning piece of the German section there.

Forty-five precious historical documents relating to the voyages and discovery of America are to be exhibited at the World's Fair. The Duke of Veragua, the living descendant of Columbus, has agreed to lend them. The 45 papers form almost a history of Columbus' career as discoverer. In the list is the original commission given to Columbus by Ferdinand and Isabella upon his departure for the first voyage. It is dated Granada, April 30, 1492. In it he is appointed grand admiral of the ocean seas, vice-king and governor general of all the lands he should discover. Every document in the collection is either written by Columbus or signed by Ferdinand or Isabella.

Excellent progress is being made in preparation of the official catalogue of the exhibits at the Exposition. The department of publicity and promotion has in charge the collection and preparation of the data for this voluminous publication, and is pushing the work with great energy. No previous World's Fair has furnished a complete catalogue upon the opening day. The official catalogue of the World's Columbian Exposition will be on sale on May 1, and it will be complete so far as the requirements of the general public are concerned. A few changes, such, for example, as the omission of exhibits withdrawn at the last moment will, of course, be necessary, and must be made in later editions.

Italy, which, for a long time declined to participate in the World's Fair, has made an appropriation of 277,500 lire, or about $55,500, for its representation. The Italian chamber of commerce and other financial interests have also supplied funds with liberality.

Visitors to the World's Fair will have the opportunity of going to the roof of the Manufactures building—the largest in the world—and enjoying there a half-mile promenade. Four elevators, with a capacity of 600 an hour, will take the people to a great platform, 200 feet above the floor, from which a magnificent bird's-eye view will be afforded of the interior of the mammoth building, with its acres of exhibits beneath. From the platform the visitors will pass to the promenade on the roof, where an unsurpassed bird's-eye view of the entire grounds and buildings will be unfolded.

Special fete days will be a prominent and interesting feature at the World's Fair. The different States, foreign countries and many civic organizations will each have a day upon which to conduct special exercises or celebrations, and programmes for them are now being arranged. Following are the days already assigned for such celebrations:

Washington	May 17
Wisconsin	May 23
Maine	May 24
Denmark	June 5
Germany	June 15
Nebraska	June 15
Massachusetts	June 17
New Hampshire	June 21
France	July 14
Utah	July 24
Liberia	July 26
Commercial travelers	July 26
Independent Order of Foresters	Aug. 12
Hayti	Aug. 16
Colored people	Aug. 25
North Carolina	Aug. 18
Austria	Aug. 18
The Netherlands	Aug. 31
Nicaragua	Sept. 1
New York	Sept. 4
Brazil	Sept. 7
California	Sept. 9
Maryland	Sept. 12
Michigan	Aug. 13 and 14
Kansas	Aug. 15
Colorado	Sept. 19
Montana	Sept. 20
Patriotic Order Sons of America	Sept. 20
Iowa	Sept. 21
Rhode Island	Oct. 5
Spain	Oct. 12
Italian societies	Oct. 12
Minnesota	Oct. 13

The 40,000 souvenir quarter-dollars which congress authorized to be minted for the Board of Lady Managers of the World's Fair will be issued, it is expected, by May. One of the special features of the new coin is that it is the first issued by this government to bear the portrait of a woman. Other coins bear idealized representations of the fair sex, but this is the first to be honored by an authentic reproduction of a particular feminine face. The coin is intended by the national government to commemorate two important events—the aid given by Queen Isabella to Columbus which enabled him to make the voyage of discovery to America; and the first special provision made by the United States Government for the adequate participation of women in an enterprise of world-wide importance.

Apart from the general interest imparted to the coins by national legislation and historic associations, their market value will be augmented by the fact that every coin collector in the world must have one. The Catholics throughout the world and the people of the Spanish race will be interested in the souvenir in appreciation of the honor extended to the memory of their greatest Queen by this government. M. J. B.

Chicago, May 6.

THEFT AND CONSPIRACY CHARGED.

THE WESTINGHOUSE COMPANY BRINGS SUIT AGAINST GENERAL ELECTRIC OFFICERS.

BLUE PRINTS AND SPECIFICATIONS SAID TO HAVE BEEN STOLEN FROM THE PITTSBURGH FACTORY OF ONE COMPANY AND DISCOVERED IN THE LYNN FACTORY OF THE OTHER—THREE ARRESTS IN PITTSBURGH AND OTHERS PROMISED IN BOSTON —A TALE THAT GIVES ELECTRICAL PEOPLE POINTS TO DISCUSS—INTERVIEWS WITH SEVERAL OFFICIALS.

A Pittsburgh press despatch of Saturday last contains the following:

Morris W. Mead, Chief of the Bureau of Electricity, of Pittsburgh, and also an electrician at the World's Fair, and Frank Carey and Joseph Butler, were arrested this afternoon (Friday, May 5), charged with conspiracy. The information was made before Alderman McMasters by A. S. Carpenter, counsel for the Westinghouse Electric Company.

The three were taken before the Alderman and Mr. Mead furnished the $2,000 bail required and was released. The others waived a preliminary hearing and were sent to jail. At the same time Carpenter entered suit for conspiracy against Charles A. Coffin, president; William J. Clark, Milton H. Hamilton, E. Wilbur Rice and Walter H. Knight, all with the General Electric Company and residents of Boston. Officers will be sent to-day to Boston to serve the latter warrants.

Recently the Westinghouse and General Electric Companies submitted competitive plans for the power plant of the Cataract Construction Company at Niagara Falls. A short time later the Westinghouse officials were surprised to learn that the General Electric Company had withdrawn the plans first submitted, and had submitted new ones bearing a decided resemblance to the plans on which the Westinghouse engineers had spent months of hard work. This resemblance could only be accounted for on the theory that in some way the General Electric Company had procured copies of the drawings made by the Westinghouse engineers.

On investigation by a REVIEW representative, it was learned that Frank Carey was employed as assistant in the draughting rooms of the Westinghouse Company and Joseph Butler was the night porter who carried the keys to the draughting room, which was in the company's factory in Pittsburgh.

These arrests have caused quite a stir in electrical circles. The accused are directly charged with stealing or aiding to steal plans, specifications, price lists, blue prints of all sorts of electrical contrivances and patterns, from the Westinghouse Company and turning them over to the General Electric Company for its use.

In an interview Mr. Mead declared that he had no connection with the General Electric Company and denied all knowledge of the abstraction of the plans from the Westinghouse Company. It was stated by an official of the company that ever since July, 1892, the Westinghouse people suspected that their rivals, the General Electric Company, were obtaining in some peculiar manner, blue prints and plans, specifications, cost of apparatus, proposals and prices which the Westinghouse Company were making in competition with the General Electric Company. The remarkable disappearance of duplicates from the office of the company's rooms caused a searching investigation to be made, and detectives were put on the case, which resulted in the above action. The report given out is a simple narration of the means employed to discover the source of these alleged wholesale pilferings, and concludes as follows:

It is declared that as far back as July last an arrangement was made, with the knowledge of officials of the General Electric Company, by which a certain young man entered the employ of the Westinghouse Company as a draughtsman at the works in Pittsburgh, for the very purpose of getting into the secrets of the company, for the benefit of the General Electric Company. Besides receiving a salary from the Westinghouse Company, he is averred to have received a much larger salary from the General Electric Company, and a liberal fund, by means of which he was placed in a position to be regularly furnished with blue prints and other information secured from the offices and works of the Westinghouse Company.

Several hundred blue prints and drawings, including almost all of the improved new designs of the Westinghouse engineers, and copies of a great many papers, were said to have been furnished to the Westinghouse Company's rival—frequently so promptly that the General Electric Company could utilize the designs of the Westinghouse engineers almost as promptly as the Westinghouse Company itself.

At this point quite a large number of missing blue prints were located at the Lynn factory of the General Electric Company and the Westinghouse Company served upon the General Electric Company, the Thomson-Houston Company and several of their officials, a notice to the effect that all the Westinghouse blue prints described in the replevin previously served were stolen property, and that, in case they were not promptly returned to the Westinghouse Company, further proceedings would be taken.

The Westinghouse Company believes it has complete evidence of all these alleged facts, supported by a large mass of original correspondence passing between the officials of the General Company and certain parties in Pittsburgh.

It is stated that the blue prints above mentioned were safely ensconced in two particular drawers in the desk of an official in Lynn, and there the replevin was obtained, but upon search being made the only drawers found empty in the desk were those alleged to have contained the stolen blue prints.

The representative of the ELECTRICAL REVIEW tried to obtain the statement of the officers of the General Electric Company and their version of the controversy. Mr. R. N. Dyer, attorney, was too busy to talk upon the subject, being employed upon other matters; likewise was Capt. Eugene Griffin, second vice-president of the General Electric Company, but Mr. S. Dana Greene, assistant general manager, stated that "the charges in the matter of the Cataract Construction Company were a lie out of the whole cloth," and further declared that after their original plans were submitted the Cataract Construction Company had asked some questions involving the preparation of supplementary plans, many of the questions being solely for the purpose of elucidating ideas already shown in the original specification, and that the General Electric Company had not withdrawn their first submitted plans.

The Westinghouse officials had nothing to add to the statements published above. They all were evidently quite confident of the justice of their case, and were content to await developments. That is a good thing to do, and these developments will be correctly and promptly chronicled here.

The case of the Electrical Manufacturing Company, Oconto, Wis., and the General Electric Company, over the lamp litigation, in the court at Milwaukee, last week, was carried over until May 5, when the case came up before Judge Seaman in Chicago.

Electrical Illumination at the World's Fair.

With 3,540 incandescent lamps blazing from all sides of the Administration Building, that mammoth structure presented a magnificent spectacle Tuesday night. The lights are 16 candle-power, and their rays illuminated the grounds and adjacent buildings so brilliantly that a pin could be seen in the roadway. It was the first time that the dome and cornice of the Administration Building were lighted.

Visitors who remained at the grounds until dark were well repaid for waiting. They beheld one of the prettiest sights they had ever seen. The dome of the Administration Building looked as if it were studded with diamonds, while the cornice illumination, with a background of white, was a sight never to be forgotten. It was, indeed, a grand display. The peristyle, casino and music hall were also illuminated, nearly 2,000 globes casting their rays on the bronzed statue of the Goddess of Liberty at the east end of the building. The reflection from the lights cast dancing shadows on the water, and, looking cast from the Administration Building, the lagoon formed a picture that would make an artist famous if he could truthfully reproduce it on canvas. The thousands of persons who had not yet left the grounds gazed at the magnificent scene in wonder. Slanting shadows pierced the waters of the lagoon, and all that was needed to transport it into fairyland was the presence of the Venetian gondoliers.

But these were not the only illuminations. The Manufactures, the Mining and the Agricultural buildings were also lighted brilliantly. Lights blazed for a short time in the dome of the Horticultural Building, but no attempt was made to illuminate the structure, as admission was denied visitors after seven o'clock.

On the dome of the Administration Building are eight ribs, and on each rib were 40 incandescent lights that burned for three hours. The cornice just below the dome was studded with 420 lights, and on the lower cornice 800 globes. Inside the building 2,000 lights were blazing, equal to 32,000 candle-power. It was the exterior view of the building, however, that attracted the attention of the crowds. The ribs on the dome looked from a distance like strings of diamonds, and the blazing globes on upper and lower cornice made a sight that people went into raptures over. Nothing like it in the way of illumination was ever before seen in Chicago. M. J. B.

Chicago, May 6, 1893.

Taylor, Goodhue & Ames will remove from their present quarters in the Monadnock building to 348 Dearborn street, where they will be pleased to see their friends. This company are preparing a very neat catalogue describing their specialties, which will be ready for distribution soon.

HARTELIUS ELECTRICAL GENERATOR ATTACHED TO ROCKING CHAIR.

An Electrical Rocking Chair.

A dynamo attachment for a rocking chair, designed to send a mild current of electricity through a person sitting in the chair—such current being generated by the motion of rocking—is shown in the accompanying illustration, for which we are indebted to the *Scientific American*, and has been patented by Mr. Charles E. Hartelius, of Bay Ridge, N. Y. The dynamo, which may be of any usual type, is fastened on the under side of the chair seat, and on one side of the field of the dynamo is a keeper connected with a handle rod on the chair back, by adjusting which the pole pieces may be connected at any desired point to control the strength of the current. The dynamo is driven by a belt from a shaft journaled in hangers on the chair bottom, the shaft being operated by a belt from one end of a lever in connection with a spring-and-ratchet mechanism. The lever is pivoted to the lower end of a hanger, and at its lower end is a caster or roller, which runs upon the floor, so that as the chair rocks the lever is alternately depressed and elevated. The dynamo is connected by wires with electrodes on the arms of the chair, or with hand pieces, which may be held by one desirous of receiving the current, or with metal foot rests, so that one may by either means receive a mild current of electricity. A gentle current may thus be taken for any desired length of time, the chair being used in the ordinary way when the body is kept out of contact with the electrodes.

This is certainly a most novel method of generating electricity. May we expect to see the day when rocking chair central supply stations will be established? We guess not, for, judging from the expression on the woman's face in the picture, the old thing isn't working just right. The attitude of the hands, according to the Delsartean theory, indicates expectancy or supplication—either she isn't getting any current and is expecting it, or else she's getting too much and wants somebody to throw the main switch. Her feet are bare, too, and that isn't nice.

ELECTRIC LIGHT FLASHES.

An electric street car line and lighting franchise will be let at Dunkirk, Ind., this week.

Secretary Fitzgerald, of the Detroit Electric Light and Power Company, has pleaded not guilty to a charge of bribery, and gave bail in the sum of $5,000.

A partition wall in a new electric light building, at Cincinnati, O., collapsed last week, carrying 14 workmen into the cellar, a distance of 40 feet. Five men were killed and three seriously injured.

New York capitalists, through John J. Vanz, attorney of that place, contracted for the Shelbyville, Ind., Electric Street Railway Company to build a line before next August. The company reorganized by electing Judge Hord, president; Edward Major, secretary; and W. Scott Ray, treasurer. It holds a 50-year franchise.

A mortgage has been issued for $350,000, given by the Detroit Electric Light and Power Company to the Central Trust Company, of New York, and covering the company's plant in Detroit. It was dated April 1, 1892, and was given to secure first mortgage bonds to fall due in 1922, and to bear six per cent. interest. The mortgage is signed by W. B. Moran, president, and W. H. Fitzgerald, secretary and manager. The action was authorized at a meeting of the board of directors held February 13, 1892, and in the instrument it is stated that the Detroit Electric Light and Power Company, on and after April 1, 1892, is to be known as the Electric Light Company. In the light of these facts it cannot be construed that the mortgage has any connection with the arrest of Manager Fitzgerald and the charges of bribery, but it does in a measure explain the absence from the city of President Moran and Ralph Phelps, Jr., who are now in New York.

Steam and Electric Launches in China.

REPORT BY CONSUL FOWLER, OF NINGPO.

On April 22, 1893, the Department of State received from Consul Fowler, at Ningpo, China, the following communication, which is of great interest to manufacturers of steam, oil or electric launches:

In a recent interview with the Taotai of this circuit, I pointed out to him the great advantage in the saving of time and comfort that would accrue if he adopted the modern method of traveling by the use of a steam, oil or electric launch in his journeys about this district. I explained, to the best of my ability, the workings of the various kinds of launches, and he seemed so pleased with the idea of being able to travel with greater comfort and more speed than is now the case, that he requested me to write to the United States for particulars; therefore, I have the honor to request that the department will kindly place this before the manufacturers of launches, in order that they may tender diagrams, cuts, etc., so that I can have the matter placed before his excellency, thus enabling him to select such launch or engine as seems most suitable for these waters. It must be remembered that this vast district is intersected by thousands of miles of canals and rivers; and, although it covers a territory of 39,500 square miles and has a population of from 25,000,000 to 35,000,000 people, there is not a single launch or boat of any kind propelled by steam, oil or electricity, excepting a few launches that ply from Shanghai to Hangchow, the capital, 150 miles northeast of this port.

The Taotai has occasion to go to the capital frequently. He travels in a small covered boat propelled by "ya lows" (large oars) worked similarly as a whale boat is worked—*i. e.*, by sculling. The average distance traveled in a day is 100 lis, or 33⅓ miles.

A boat suitable for China would have to be built very strong, the propeller be so arranged that it could be taken up or protected in some way from the ropes that are passed around the stern of the boat while it is being pulled over the "haul over" from a river to a canal or from a lower to a higher canal. A "haul over" (over part of the bank sloped for the purpose by masonry or earthwork and covered with wet and slippery clay) forms a sluiceway. A boat to pass from a river to a canal has a rope passed around the stern, the ends of the rope being wound around a windlass on each side of the sluice. Men work the windlass on both sides until the boat has hauled to the ridge, when it is pushed into the water. There are no locks. Sometimes a boat is dragged across a "haul over" by water buffaloes or oxen, but the first method is the common one hereabouts.

Another consideration is, that in some places the canals are only wide enough for a boat of the regulation size. This is especially so between the supports or arches of bridges. Finally, the bridges are so low that it is of the greatest importance that the roof of the cabin or cover should not be so high as to prevent the boat from passing under them.

The boats for traveling are called house boats. Foreign boats use a hull built native fashion, and in or on this hull is erected a small house, fitted with windows, berths, closets, etc. They are quite comfortable, and one can travel for weeks; in fact, it is the only way one can travel in this part of China. The boats used by the natives are not so comfortable, yet are often more expensive.

If it is possible for manufacturers to build an engine that can be placed in the boats used here, I think that there would soon be a large demand for such engines. The canals are the only roads, and all travel is, of course, by boat. The traffic carried on by boats is very large. The introduction of quicker methods of travel would be highly appreciated, especially if the Taotai sets the example, and I deem this a most auspicious time to introduce our methods into this province.

Some years ago I saw in Washington a boat which, I think, would be especially well adapted for China. If I recollect aright, it was a petroleum launch made in Providence, R. I., by Brayton (?); but such rapid strides have been made since then that possibly there may be more suitable kinds on the market now.

For the guidance of interested parties, the following description may be of some use: Length, 38 feet; breadth, 6 feet 10 inches; height from keel to rail, 3 feet; height from rail to top of house, 2 feet 9 inches.

A flat-bottom boat is, of course, preferable and one that follows the Chinese style. It has occurred to me that it may be possible that a boat could be built with a top or house, having the sides arranged in such a manner that it could be telescoped or lowered. In that case the roof could be higher than in a stationary one. One without a smokestack or with a smokestack that is easily lowered would be popular; in any case, the stack must be a very short or low one. It would be well for the manufacturers to include in their estimates the cost of delivering the same by steamer or sailing vessel at Shanghai or Hong Kong.

I have been discussing the benefits of small launches with the Taotai for the past two years, and now he has requested me to find out all I can for him. If he should adopt a launch for his own use, I am quite confident that it will not be long before many orders will be placed with our manufacturers. There is a splendid opening here. An immense traffic is carried on in boats, which now depends on the tide and the endurance of the "yu loese" (scullers). A company of Chinese has been organized at Swatow, who run a steam ferry (launches) a short distance up river, and I understand they are doing a very lucrative business.

American Electro-Therapeutic Association.

We have received the following communication from Dr. Margaret A. Cleaves, secretary of the American Electro-Therapeutic Association, whose office is at 68 Madison avenue, New York city:

At a meeting of the executive council of the American Electro-Therapeutic Association, held at the office of the secretary, March 2, 1893, the following resolution was adopted:

"*Resolved*, That the secretary be instructed to prepare a circular to send to Fellows of the Association, to members of the medical profession, to electrical experts and to manufacturers of electrical appliances for medical work, containing titles of all the committees, the members serving on them with their addresses and the matter prepared for discussion and investigation by each committee.

"And that manufacturers be asked to communicate with the members of the different committees if they desire to have their instruments examined and tested, stating their claims and merits.

"And that physicians, electrical experts and manufacturers be asked to co-operate in making suggestions, and in relating their experience and preference for instruments, with reasons and data.

"And to mail this circular to all members of the Association, manufacturers, medical journals, and to others who are known to use electricity extensively, asking for a speedy reply either to the secretary or to the members of the respective committee whom it concerns."

In accordance with the above resolution the following has been prepared:

COMMITTEE ON STANDARD COILS.

Dr. W. J. Morton, 19 East Twenty-eighth street, New York.

Dr. A. H. Goelet, 351 West Fifty-seventh street, New York.

Dr. Wm. F. Hutchinson, Providence, R. I.

Dr. G. Betton Massey, 212 South Fifteenth street, Philadelphia.

Mr. A. E. Kennelly, chief electrician, Edison laboratory, Orange, New Jersey.

POINTS TO BE CONSIDERED.

I. Portability.

II. Practical mechanism of machines as adapted to physicians' use.

III. Range and rate of vibration.

IV. Electromotive force and its range in relation to resistances to be overcome.

V. The resistance of the coil producing these electromotive forces.

VI. The battery power required for individual coils.

VII. Shape of the generated wave of electromotive force.

COMMITTEE ON STANDARD METERS.

Dr. Margaret A. Cleaves, 68 Madison avenue, New York.

Dr. H. E. Hayd, 78 Niagara street, Buffalo, N. Y.

Dr. Wellington Adams, 2741 Olive street, St. Louis, Mo.

Dr. W. F. Robinson, 214 State street, Albany, N. Y.

POINTS TO BE CONSIDERED.

I. A good meter should have a clear, legible scale, fairly uniform over the range, and not crowded at different points.

II. It should be capable of being noted or observed at a distance.

III. The resistance should be low.

IV. There should be no tendency to overheat with the strongest current employed.

V. It would be advantageous to avoid a shunt, if one milliampere can be read through the scale.

VI. The instrument should be capable of indicating in all positions.

VII. Any instrument whose indications depend directly upon the local magnetic force is objectionable, for the reason that its indications are liable to be affected by iron in the vicinity.

VIII. The suspended system should require as little attention as possible, either for adjustment or shipment.

IX. It is an advantage for the instrument to indicate with either direction of the current.

X. Portability.

XI. Liability to fracture.

COMMITTEE ON STANDARD ELECTROSTATIC OR INFLUENCE MACHINES.

Dr. W. J. Morton, 19 East Twenty eighth street, New York.

Dr. J. H. Kellogg, Battle Creek, Mich.

Dr. G. Betton Massey, 212 South Fifteenth street, Philadelphia.

Dr. Margaret A. Cleaves, 68 Madison avenue, New York.

POINTS TO BE CONSIDERED.

I. Electrostatic machine best adapted to medical work, to be determined by its "output." Its output to be determined as follows:

(*a*) At, respectively, 100 and at 150 revolutions per minute. (*b*) With two Leyden jars, each of whose outer metallic surfaces has the area of $4\frac{1}{4} \times 1\frac{1}{8}$ inches $= 5\frac{1}{8}$ square inches. (*c*) With discharging rods having ball terminals one inch in diameter and arranged, respectively, six inches and 10 inches apart. (*d*) Give the number of sparks per minute which will pass between the discharging rods.

II. Give the greatest maximum length of spark with machine arranged as in section I, except as to distance apart of the discharging rods.

III. Give the maximum length of the brush discharge between the discharging rods with machine arranged as in section I, except that no Leyden jars are used.

IV. Give the maximum length of spark that may be obtained by a brass ball electrode, two inches in diameter, from a person's back, seated in the usual manner upon an insulated platform—the platform connected to one prime conductor of the machine, the other being connected to the ground. (*a*) With above Leyden jars. (*b*) Without Leyden jars.

V. Kind of electrostatic machine best adapted to medical work, whether a Holtz, Wimshurst, Toepler, Voss, Carré, Lewandowski, Toepler-Holtz, Wimshurst-Holtz or machine not here named, provided the type as constructed successfully fulfills requirements outlined in section I.

VI. Does the machine preferred easily reverse its charge? Does it maintain its charge successfully?

VII. Facility and means of charging machine under all atmospheric conditions.

VIII. Can a good meter to measure the output of the machine be suggested?

IX. Mechanical construction of machine. (*a*) Ease of actuating machine by motive power. (*b*) Durability of the mechanism causing the revolution of its plates. (*c*) Durability of its construction. (*d*) Is a glass case necessary?

X. The best means for drying the air within an enclosing glass case.

XI. The best means for absorbing the ozone and nitrogen compounds formed within a glass case.

XII. Is it not advisable to decide in a general way that no machine, the diameter of whose revolving disks is less than 26 inches, and the number of whose disks is less than six, should be recommended by this committee for medical work?

COMMITTEE ON CONSTANT-CURRENT GENERATORS AND CONTROLLERS.

Dr. W. J. Herdman, 48 East Huron street, Ann Arbor, Mich. Rheostats and dynamo current controllers.

Dr. Robert Newman, 68 West Thirty-sixth street, New York. Primary stationary batteries.

Dr. Frederick Peterson, 201 West Fifty-fourth street, New York. Secondary batteries and primary portable batteries.

POINTS TO BE CONSIDERED.

I. Primary batteries. Express preference and reasons therefore for a battery, voltage, modification and control of current strength, current generator, etc.

II. As to cells and secondary batteries. What are the defects and inconveniences? What the advantages over other forms? What the ampere hours, what the constancy, voltage and action?

III. As to dynamo currents. What the nature of the current, what its voltage, how is it modified by the form of controller under consideration?

IV. Report new forms of batteries and improvements, with claims as to superiority over those now in use.

V. Rheostats. Tests, various forms and devices to modify and control currents; difference in effect produced by each, mechanically, chemically or physiologically.

COMMITTEE ON STANDARD ELECTRODES.

Dr. A. Lapthorn Smith, 248 Bishop street, Montreal, Canada.

Dr. R. J. Nunn, 119 York street, Savannah, Ga.

Dr. Charles R. Dickson, 263 Victoria street, Toronto, Ontario.

POINTS TO BE CONSIDERED.

I. Inactive electrodes. 1. What is the best material in general for the ground-work of the electrode and what in special cases? 2. How may it best be connected with its rheophore? 3. What is the best material to cover its conducting surface? 4. When necessary, how may it best be insulated? 5. In what way may it be kept warm and moist when not in use, should this be necessary? 6. What should be accepted as standard sizes and shapes, and how best designated? 7. What other points require to be considered.

II. Active electrodes. 1. What is the best material in general and in special for the ground-work of the electrode? (*a*) When used at the positive pole? (*b*) When used at the negative pole? 2. How may it best be connected with its rheophore? 3. What is the best material to cover its conducting surface when necessary, in general and special? 4. How it may be insulated when necessary? 5. What is the best form of construction where flexibility is required for tortuous canals? 6. What shall be considered the standard shapes and sizes; what scale shall be adhered to in considering the latter; how may their surface area be estimated when they are of irregular shape? 7. When designated by numerals as to size and surface, how may such best be expressed when stamped or otherwise marked on them? 8. How may simplicity of construction be best obtained and cost of manufacture reduced without impairing efficiency? 9. How may facility of cleansing and rendering aseptic best be achieved? 10. What other points to be considered?

III. Active and inactive electrodes. 1. Are the terms "active" and "inactive" the best standard terms we can employ? 2. In the case of both active and inactive electrodes, should not the threads of all screws used in construction as a means of attachment, also all plugs and sockets, etc., be of a standard gauge, that electrodes might be used with attachments of all makes, etc., and to facilitate repair.

A prompt and full reply from any one interested is earnestly solicited to any or all of the points above suggested.

ELECTRIC RAILWAY AND POWER NOTES.

A hundred and thirty miles of street in Philadelphia will be torn up this summer for building trolley railroads.

The Schuylkill Electric Railway Company, of Pottstown, Pa., has decided to advance the wages paid its employés, paying 14 cents per hour and making nine hours a day's work.

An electric belt road will be in running order around the battle-field at Gettysburg by July 1 next. Twelve double-decker cars of 60 horse-power each with a trailer will be put on, and these will be capable of carrying 2,000 people an hour over the field.

The city council of Charleston, S. C., by a unanimous vote granted a franchise to the Enterprise Street Railway Company to construct an electric railway system throughout the city. The Enterprise Railroad has been bought by the Great Western Manufacturing Company, of Chicago.

The formal opening of the connecting bridge across the Big Beaver at Elwood Junction, Pa., took place recently. Its completion affords a direct inlet of the P. & L. R. R., or Lake Shore system, and N. Y., P. & O. R. R., making in all four leading trunk lines entering Elwood City. Electric cars will run over the bridge and make connections with all trains.

There are seemingly fair prospects of McKeesport, Pa., securing another important railway connection. The Pittsburgh, Greensburg and Latrobe Electric Railroad Company, which was chartered last week, intends to commence work on the road at once. The road will pass through all the towns along the main line of the Pennsylvania Railroad, and branches will be constructed to the inland towns. A branch leading from Wilmerding will be built to McKeesport. The company represents a capital of $1,000,000.

The affairs of the San Francisco and San Mateo Electric Railroad, which have been in a chaotic state almost ever since the inception of the road, are now in a fair way to be straightened out and the road placed in the hands of a new management. Word has been received from New York that a deal has been consummated with certain eastern parties, and that the principals were on the way to close up the sale. The road is considered by those in a position to know one of the best pieces of railroad property in San Francisco, but through lack of funds and bad management has managed to keep itself in hot water for the past six months.

The "Victor" Key Opens the World's Fair.

At Chicago on May 1 President Cleveland formally opened the World's Columbian Exposition by touching a telegraph key which completed an electric circuit and started in motion the big Allis engine and the Worthington pumping plant, and rang a big gong which gave the signal for starting all the other machinery then in running order.

The telegraph key with which this historical service was performed was made of solid gold with an ivory button and was of the well known "Victor" type, manufactured by E. S. Greeley & Company, of this city. This key will be on exhibition at the E. S. Greeley & Company's World's Fair headquarters in the Electricity Building, floor 1, section F, space 8, where the company also has a large and very elaborate electrical and railway exhibit.

The initial electric current that was employed upon the circuit which was closed by President Cleveland when he pressed the "Victor" telegraph key, was derived from four cells of Greeley "Exeter" dry battery.

GREELEY
EXETER
DRY BATTERY
PATENTED
DIRECTIONS. ATTACH THE WIRES TO THE TERMINALS AND ALL IS READY.
KEEP DRY & COOL AND NOTHING WILL BE FOUND TO BEAT IT.

FIG. 2.—THE "EXETER" BATTERY WHICH SUPPLIED CURRENT TO THE GOLDEN "VICTOR" KEY.

The electromotive force of this cell is 1.5 volts and the amperage 8. The size (cylinder) is 6x2½ inches.

As the President was concluding the final sentence "as by a touch the machinery that gives life to this vast Exposition is set in motion, so at the same instant let our hopes and aspirations awaken forces which in all time to come shall influence the welfare, dignity and freedom of mankind," his eyes wandered to the table that was close at his left hand. Upon this was the key, the pressure upon which was to start the machinery, and make the opening of the Exposition an accomplished fact. It was an ordinary form of "Victor" telegraph key, such as is in use in most telegraph offices. As the last words fell from the President's lips he pressed his finger upon the key, and the Fair was opened.

GENERAL NOTES.

A telephone line is to be put up between Savannah and Pooler, Ga., a distance of nine miles.

A Western Union director is quoted as saying that the receipts for the week ending April 29 were the largest in the history of the company.

The street railway consolidation in Cleveland, O., went into effect on May 2. The four cent fare has been adopted by all lines in the city with two exceptions.

The proposed electric railway from East Stroudsburg to Wind Gap is to be extended to Nazareth and Bethlehem, Pa. The road is expected to be opened by July 4.

The Wisconsin Telephone Company will entirely reconstruct their plant at Washburn, Wis., using the automatic exchange. The new system will be in operation by May 1.

Electricity and Manufacture.

A mechanical engineer of an observing turn of mind recently remarked that the small electric motor bid fair to revolutionize manufacture in many of its branches by placing men of small means more nearly on a level with those of large means or great corporations or companies. And this, he reasoned, would result in improving the quality of things manufactured and be in every way advantageous.

This may be a rosy view to take of the case, but there is considerable reason behind it. One of the greatest needs of the man working by himself or in connection with two or three or a half dozen others is cheap motive power. He or they may require but little power, and that irregularly,

FIG. 1.—THE "VICTOR" TELEGRAPH KEY.

but that little is wanted just as much as the large manufacturer wants a good deal. In this—the employment of motive power—the individual workman is usually at an enormous disadvantage as compared with the large manufacturer, with whom he must compete. This disadvantage begins with the first cost of motive plant, and follows all through its operations. The cost of engine and boiler, the space required for them and the cost of fuel, water, attendance and repairs are enormously against the isolation of manufacture; they are all in favor of its centralization.

But with the small electric motor of satisfactory construction and operation, with this and electricity on tap, to use an expressive phrase, furnished at reasonable cost, this disadvantage would become strikingly less. With the ability to take power "into the back yard," and to pay for just what is used, the individual would be able to make a very satisfactory step towards the front; in some branches of the trades he might get quite to the front.

The individual, or the little band of two or three, would have one thing in his or their favor, and not a small thing in its operations, either. That is human nature. No man will work for another as well as he will for himself, or at least the exceptions to this rule are no more than sufficient to prove it. With average humanity the difference in this respect is greater than would generally be believed, that is to say, the difference in the results that obtain. It is greater than the most interested party—the individual workman—would believe, himself, until he had made the trial.

As to the quality of what is made to sell, the individual would see the absolute necessity of preserving that as he never—no matter how honest he might be—could see it when working for the large employer of labor. Working for himself he would realize that his chances of success, of gaining and preserving a reputation that should create and maintain a demand for what he made, depended upon himself alone. Working for others there is great likelihood that the habit, or practice, of thinking that one man cannot accomplish much, anyway, in keeping up the reputation of a great concern, or its solvency, as to that matter, will take possession of the individual. Such plans as profit sharing and the like have their origin in the belief of employers of labor that something must be done to create an interest amongst workmen, and that the best way to do this is to convince them that, to a certain extent, they are working for themselves; that the right or the wrong doing of one is the concern of all. This plan has worked very well indeed, we believe, in some instances, but manifestly it cannot bring about the same results in the instance of almost any man that would be brought about by the feeling that he was working, individually, for himself. It would be necessary to reconstruct mankind before that would be the case.

After all, perhaps the engineer to whom reference has been made is not so far astray in his conclusions as to the possible influence of the electric motor on manufacturing as might appear at first thought. A good deal may—must—depend on the degree of perfection to which the distribution of power by the employment of electricity is brought. —*American Machinist.*

FIG. 3.—PRESIDENT CLEVELAND TOUCHING THE "VICTOR" GOLDEN KEY WHICH SET IN MOTION THE WORLD'S FAIR MACHINERY.

The deal by which the Terre Haute Electric Street Railway is to be sold to an eastern syndicate for half a million dollars is about perfected, and the formal transfer, it is stated, will be this week. The men, Leslie D. Thomas, R. W. Rippetoe and Willard Kidder, all of Terre Haute, own the entire stock, and at the price named they make a profit between them of $200,000 for a two years' ownership of the line. Russell B. Harrison induced the purchasing syndicate to look to this city. The new company will at once make eight or ten miles of extension.

The Porter Motor.

The accompanying cut shows the well known original Porter standard motor, Type No. 1. These motors, made in four sizes (the cut representing the smallest size) are too well known to require any introduction at this time, as they have been in use during the past four years, and their efficiency has been thoroughly tested. Mr. M. D. Porter, who was the pioneer manufacturer of battery motors, personally superintends the construction of all motors made by the Porter Electric Motor Company, which announcement is of itself sufficient assurance that the high standard of excellence established by him will be maintained in all motors made by the company bearing his name. The ever increasing demand for the Porter type of motor has necessitated the fitting up of an enlarged factory with new and improved machinery, which will enable the Porter Company to not only more than quadruple their former output of battery motors, but also to make power motors of from one-eighth to two horse-power capacity. An entirely new type of fan motor will soon be placed on the market, the advance sale of which is assuming very large proportions. Due announcement of this motor and also several other specialties of the Porter Company will be made soon.

THE PORTER FAN MOTOR.

Their office is at 62 World building, N. Y., and the factory at Jersey City. To secure prompt shipment, orders for summer trade should be sent in early.

TELEPHONE CHAT.

Aurora, Neb., business men are making arrangements for a local telephone exchange, and also a long distance service.

The Central New York Telephone Company has notified its Oneida patrons that after May 1 those using long distance telephones will be obliged to pay a rental of $100 a year, which is an advance of 50 per cent.

The telephone line between Dana and Barre, Mass., is rapidly approaching completion. Offices will soon be opened both at the former village and the center. A large force of men and teams have been employed on the work.

The Cayadutta, N. Y., Electric Railroad intend to make practical use of the telephone with their cars. Four trains will be equipped with the instruments. The crew of each train can talk with the superintendent at any time whether at stations or not.

The executive committee of The Erie Telegraph and Telephone Company have recommended to the directors that a quarterly dividend of 1 per cent. be declared, payable May 13 to stockholders of record May 6.

Ald. Hurteau, of Montreal, says that unless the Bell Telephone Company agrees to the proposals of the city respecting reduced rates to citizens and a telephone tax payable by the company to the city on each telephone, the city council will proceed to grant permission to the Merchants' (Opposition) Telephone Company to put up poles and string wires.

The Cleveland, the Northwestern and the Southwestern companies report for the three months ending March 31, 1893, a

Gross income of	$343,012.31
Gross expenses, including dividends paid	234,177.78
Surplus	$8,834.53
Proportion of dividends received by the Erie	57,080.00
Dividend No. 88	48,000.00
Surplus	$9,080.00
Total surplus for three months	17,914.53

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These are stirring times in electrical circles. It is apparently war to the knife among several of the big companies.

It would be well for all those interested in electrical progress to keep an eye on Messrs. Claflin & Kimball, of Boston, and the companies they represent.

The inventors who do not have a non-infringing incandescent lamp are becoming scarce. If this keeps on they will be entitled to rank with the first inventors of the telephone!

Last week was not a particularly happy one for the General Electric Company. The attack on "Industrials" in Wall street caused the price of the stock of the company to fall some twenty-five points, and charges were made implicating several of the company's employés in the purloining of the plans of the Westinghouse Company. The stock, however, went back to nearly its former figure the next day, but on Monday fell off seven points, presumably on account of the charges of the Westinghouse Company, which are yet to be investigated.

Through the courtesy of Prof. Elisha Gray, of Chicago, we have received a copy of the following cablegram sent to him from London:

WHITEHALL CLUB, London, May 5.

ELISHA GRAY, Chicago:

The electrical engineers of England, dining together at their club to-night, desire to convey to their professional brethren in Chicago sincere congratulations upon the opening of their grand exhibition. We hope to appear in person August next to support the success of your magnificent undertaking. (Signed) PREECE.

All American electricians will appreciate Mr. Preece's congratulations, and will be very glad to welcome him to this country.

The Press Club Fair, which continues at the Grand Central Palace during the month of May, is well worth the price of admission. Many beautiful electrical effects may there be seen, besides hundreds of interesting exhibits. The cause is a worthy one and deserves the support of every thinking citizen of New York. Furthermore, the value returned for the admission fee is far in excess of anything that has ever been seen here before in the fair line.

FOREIGN INSTALLATIONS IN FRANCE.

The French national pride is sorely wounded by the course events have taken during the past few years in the electrical industries in that country. Generally speaking, native genius, when it has departed from theory, has only undertaken the production of electrical machinery and the carrying out of electrical work on a small scale, as compared with some other countries, and the result is that in some of the largest enterprises foreign plant is either made or used. As far as lighting is concerned, there are at Paris, working important districts, foreign concerns, such as the Edison Company, the Popp Company and the Alsation Company of Mechanical Constructions, using Siemens' plant, whilst at Havre Ferranti alternators are employed. In the case, however, of manufacturing, the four largest engineering and metallurgical works in France construct electrical plant under foreign patents. The great Creusot works build the machinery and apparatus of Ganz & Co., of Buda Pesth; the Compagnie de Fives-Lille those of the General Electricity Company, of Berlin; the Etablissements Cail the Berthoud-Borel cables, and the Societé Alsacienne de Constructions Mecaniques make the plant of Siemens & Halske, of Berlin. This state of affairs is partly attributed by a French journal to the protective tariffs of France. That may or may not be the case, but it is significant that in heavy electrical engineering appliances made under foreign patents take a leading position in France; and the efforts of the legislature, in endeavoring to stop foreign plant, especially at the frontier, have been foiled by the existing tariffs.

BLUE PRINTS ASTRAY.

On Saturday last the electrical fraternity was startled by the announcement of a suit instituted by the Westinghouse Electric and Manufacturing Company against the General Electric Company to recover certain blue prints alleged to have been stolen from their Pittsburgh works, and consequent arrest on charge of larceny and conspiracy of persons thought to be implicated. On another page of this issue will be found a complete history of the case up to the time of writing.

It is indeed difficult to imagine that the designated principals in the General Electric Company could be aware of proceedings such as are claimed to have been carried on by their employés without putting a stop to them. In fact we think it impossible for men of their recognized standing to lend themselves to such practices. The General Electric Company is a huge concern and requires the most careful management and vigilant direction on the part of its head officials, who must depend on and render themselves liable to the actions of their subaltern officers. There is no lane without a turning, and it would be indeed strange if out of the thousands of their employés there would be none who would be proof against temptation.

On the other hand, the Westinghouse people must have most positive proof in their possession to substantiate their assertions. A charge that a company of their high standing brings into prominence must needs be well backed up, for the consequences that may arise from their evidently long thought out action are obvious. The subject is not an agreeable one, nor the spectacle at all edifying; but the battle is waging, and it would appear that circumstances are such that when the combatants retire from the fight one of them will be badly scarred.

LETTERS FROM A LABORATORY.—XLIV.

BY JULIAN A. MOSES.

The necessity of performing an experiment immediately after the conception of the idea that required it should be apparent to laboratory workers. Those who have worked on this line have seen the advantage to be obtained and have profited by it. Note books, while they record thought impressions as they are produced, are not sufficient in themselves. The practical exposition of the thought must follow, otherwise the invention or scheme, as the case may be, is merely "on paper," and of no practical value. While the feasibility of a plan may be admitted on paper, the realization of the idea in tangible form will very likely bring out all fallacies and defects and thus lay bare those errors that may have crept in unawares.

The most celebrated inventor of this day had a rule that if anything was pronounced impossible, that was the very thing to try next. His ideas would be put upon paper and, as soon as conceived, models would be made. Naturally, if all facilities are at hand this method is comparatively easy. The hampered inventor or experimenter being restricted cannot always follow this plan, but where it is possible it is advised.

Disappointed investors can tell tales of unfortunate schemes that worked well on paper; and their experience has taught them that the alteration of the old adage "Practice makes perfect" to "putting into practice often proves a scheme imperfect," if made before they plunged headlong into "ways that were dark," might have saved them considerable.

The temperament of the true inventor is undoubtedly sanguine in the extreme. It seems almost as if this quality is essential to his success. Nevertheless the association of a clear-headed and coolly reasoning companion or employé acts as a healthy damper, and prevents too much exuberance of spirits and unnecessary enthusiasm, which are often liable to be weakening. Another inventor, possibly the most brilliant in this country, has surrounded himself with employés who seem to have grown out of that condition and merged into that of companionship; they are not merely helpers, but are associates. His work is theirs and they take a corresponding interest in all that is being done.

Of the experiments undertaken copious notes should be made, thus supplementing the initial impressions with others of more practical worth; for nothing can be more valuable from a scientific standpoint than this recorded experience. Thus the conception, the practical illustration and the recording form, as it were, the three stages of the infancy of an idea. If these are favorable, then all is clear sailing and very likely success awaits the inventor, provided there is a growing necessity for that which he has evolved. But this growing necessity is as essential to commercial success as the initial conception was to the development of the idea. Scientific success and commercial success are by no means synonymous, nor are they dependent upon each other. Certain discoveries and investigations in interstellar space, while they have been astronomical successes have had no other commercial value other than the impetus they have given to the manufacture of optical instruments, and the encouragement offered to students in that science.

It will thus be found that it is best to combine the useful with the scientific. There are many fundamental ideas and we are now so far advanced that it is expected we shall soon reach a certain period when no wonderful inventions will be made, but all energies and time will be spent upon the improvement of those things now in appreciated existence. A plane of literary and inventive quietude will soon be found, and only attainments on a par with the discovery of the means for the transmission of electricity, without the use of conductors, as we now define the term, will startle the world and make us believe that there are many more fundamental laws and facts yet to be discovered.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Committee on Streets of the Lynn city government held a meeting on the evening of May 4 to discuss the matter of changing the location of the tracks of the Lynn & Boston Street Railway Company so as to avoid the danger of grade crossings on the line of the Boston and Main Railroad. Several propositions were brought forward, but no positive decision was reached, and another meeting was called for the purpose of giving the matter further consideration. The Lynn & Boston Company are believed to be willing to coincide in any fair proposition which may be made them, and stand ready to aid in the accomplishment of the desired result.

The Electric Gas Lighting Company, of 195 Devonshire street, this city, have just gotten out their new catalogue for 1893, and it is almost needless to say to those familiar with the past productions of this enterprising concern that it is about as complete a thing of the kind as was ever published. It is handsomely bound, profusely illustrated and contains 75 pages of descriptive matter relative to the extensive line of electrical specialties handled by the firm. It represents an immense amount of labor and careful study in its compilation, and no concern interested in the electrical supply business can afford to be without one. Copies will be mailed to any address on application to the main office in this city.

Since the Recent Publication of their handsomely illustrated catalogue, the Whitney Electrical Instrument Company, of this city, have made some very important improvements in the uniformity of the scale of their new alternating current voltmeters, and these instruments are now scaled to register from 20 to 75 volts in half-volt divisions and from 40 to 150 volts in volt divisions. They are meeting with great success wherever so far introduced, and numerous applications for agencies have already been received. In addition to their voltmeters, the Whitney Company make a specialty of an ammeter for alternating currents which is claimed to be the only high grade instrument of the kind on the market.

The Milford & Hopedale Street Railway Company have been making a most determined fight for the privilege of demonstrating the success of their storage battery system on the tracks of the West End Company, and it looks now as though they would be successful in spite of the adverse report of the railroad commissioners, which was rendered a short time ago. The matter has passed into the hands of the Legislature, and a bill granting them the location asked for has passed to its third reading by a decidedly large majority. The West End Company have so strenuously opposed the scheme from the beginning that the public feel as though there must be something more behind their opposition than a mere unwillingness to have their tracks used by a rival concern, and the impression is gaining ground that the West End Company are rather afraid of the results which may follow a successful demonstration of a system which they have from the first condemned as an utter failure. There is no question but that the storage system has been well tested in Milford, and found to fulfill all the requirements demanded of it. This the West End Company do not deny, but claim it to be entirely inadequate to the heavy work of their city lines, where large cars are used, and which most of the time are crowded to their full capacity. The storage battery people have already secured a franchise for the operation of a line in Cambridge, and are striving for an entrance into Boston as an aid to making the Cambridge line a financial success, as well as giving them an opportunity of proving the perfect adaptability of their system. If the West End Company are as positive as they claim to be that the system would not answer on their lines, the surest way to prove it would be to let it have a fair trial. This they have refused to do, but the Legislature seem disposed to give the Milford Company a chance, and they will probably get by force what it would have been much better for the West End Company to have granted willingly. There are many firm believers in the ultimate perfection and adoption of the storage battery for electric traction, especially in large cities, and it seems an ill-advised policy to stand in the way of an improvement claimed to have real merit, without first allowing it a fair and impartial trial. H. G. T.

Boston, May 6.

OUR ST. LOUIS LETTER.

The Wagner Electric Manufacturing Company reported orders for a large number of their alternating and direct current fan motors, and expect the business of this season to surpass any before in the history of the company.

Secretary Nahm, of the American Electrical Manufacturing Company, stated that they would open their factory at once, now that the lamp decision was decided in favor of the Columbia people; that they would also double their force, and expected to turn out lamps and specialties on a larger scale than ever.

The Electric Club held its regular meeting to-night and was largely attended. Some matters of small importance were disposed of and a motion made to change the night of meeting. Members present, however, could not agree on a special time, and it was decided that cards be sent all members, requesting them to signify their preference, and the matter would then be decided at the next regular meeting.

After the business of the evening was over the members remained some time and enjoyed a rare musical treat, which was furnished by Mr. J. M. Hill, representing the Carpenter Electric Heating Manufacturing Company, of St. Paul, Minn. Members, with their lady friends, have been invited to be present Monday evening, at the club, when Mr. Hill will demonstrate to them the practicability of electrically heated stoves for cooking purposes. He will also exhibit at the same time several specialties manufactured by his company, such as electric flat irons, heaters, hair curlers, etc.

J. H. Rhotehamel, president of the Columbia Incandescent Lamp Company, is in receipt of letters and telegrams innumerable extending congratulations upon the victory of his company over the General Electric Company in their recent lamp suit. And besides the letters of congratulation, orders for 100,000 lamps were received within 24 hours after the decision was rendered. Mr. Rhotehamel is much elated over his success, and it certainly must be a pleasure to him to think that although he was taking up a case which others had been defeated in, his convictions proved true that the Goebel priority could be established if properly presented, and to this end devoted his whole time and energy, to be crowned with success.

The Columbia factory resumed operations immediately and although the decision was rendered yesterday they are to-day turning out lamps on a small scale. After being obliged to close their factory a number of their employés left town but all have now been notified to report for duty, and next week Mr. Rhotehamel claims he will be running a day and night force to the full capacity of their plant.

In answer to an inquiry as to what prices they would put on their lamps, Mr. Rhotehamel stated that they expected to get more for their lamps than usual, but would meet the prices of the General Electric Company. He also said: "This addition in price is made simply to protect ourselves on royalty which we would be obliged to pay in case we were defeated in the higher courts, which I do not think probable, and am sure our friends and the consumers in general will give us orders for all the lamps we can make." M. J. B.

St. Louis, April 29.

OUR CHICAGO LETTER.

Personal.—J. H. Rhotehamel, president Columbia Incandescent Lamp Company, St. Louis, Mo., was in the city Monday this week attending the opening ceremonies.—T. A. Pamperin, of the Electrical Manufacturing Company, Oconto, Wis., is in the city. The case of his company against the General Electric Company over the lamp litigation will be called Friday this week before Judge Seaman in the circuit court.

By the Bursting of a fly-wheel in the plant of the Chicago Illuminating Company, Tuesday this week, in the rear of 3025 Indiana avenue, half a dozen persons narrowly escaped death. The building occupied by the plant is a two-story brick and was badly damaged. Fragments of the broken wheel tore a hole in the rear of a house which stands close by, and the escape of Mr. Windall, who occupies the house, and family, together with the employés of the Illuminating Company, is nothing less than a miracle. The Chicago Illuminating Company furnish arc lights for business houses between Twenty-second and Thirty-fifth streets, covering the territory from State street to Cottage Grove avenue, and have several hundred patrons who were obliged to get along with the aid of gas or lamps for illumination. When the wheel broke it was running at full speed, and fragments of the same were hurled through the roof of the building with terrific force. Parts of the broken wheel blew against one of the dynamos, completely destroying the same. It is estimated that the total damage will reach $5,000; this amount includes damage to machinery and building together. It is claimed that the building alone is damaged to the extent of $1,000, but that the company will use every effort to start the plant running, and will be supplying its patrons with light within the next two or three days.

Chicago, May 6. M. J. B.

U. N. Bethel, General Manager Metropolitan Telephone and Telegraph Company.

The subject of this sketch, Mr. U. N. Bethel, lately appointed general manager of the Metropolitan Telephone and Telegraph Company, in place of Mr. David B. Parker, resigned, was born in Evansville, Ind. He graduated from Hanover College, and in 1885 he completed a course in the Columbia Law School in Washington. Later he went out West, and in Minneapolis practiced his profession. In 1889 he was engaged in the offices of the New York and New Jersey Telephone Company. His work was appreciated, and he next held the position of secretary and treasurer of that company. Hard work and close application to the pursuit of his selection has led to his appointment as general manager of the largest telephone company in this country.

The Blackening of Lamp Bulbs.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have read with great interest your short article on the blackening of lamp bulbs, and am quite pleased to see so many theories advanced in so short a space.

Kindly permit me to give my view of the question. The theory that the blackening of lamp bulbs is due to that trace of oxygen contained in the last trace of air which cannot be removed by exhaustion, was first advanced by Prof. Crookes, of London, about 1881.

There is a trace of oxygen left because the vacuum in the bulbs is never perfect,

U. N. BETHEL, GENERAL MANAGER METROPOLITAN TELEPHONE AND TELEGRAPH COMPANY.

although there may be left in the globes only fractions of a millionth of an atmosphere.

Professor Crookes held at that time that carbonic-acid gas, that is carbon dioxide, is so formed, but that is not possible under the conditions existing in the lamp globe.

Every chemist knows that only carbon-monoxide can be formed when carbon is so much in excess compared with the trace of oxygen.

There is no chemical power or chemical agent on the glass walls which can decompose carbon-dioxide or carbon-monoxide.

Volatilization is not due to any chemical action; on the contrary, it is solely due to the mechanical action of the current. Electricity is a mechanical power of nature, and if that power acts on a filament, then particles of carbon are thrown off as dust. Therefore a soft filament is more subject to volatilization than a hard one, and if a filament in a lamp is overworked, the globe may be blackened in a few minutes.

If volatilization was due to chemical action, then it ought not to make much difference whether a filament is overheated or not, because the trace of oxygen is the same in both instances.

Yours very sincerely,

Dr. L. K. Böhm.

New York, May 6, 1893.

The stockholders of the Northampton, Mass., Electric Railway, at their meeting last week, voted to petition the railroad commissioners to authorize the company to issue new stock to the amount of $100,000. J. C. Hammond, the president, says the whole of this new stock, if allowed to be issued, can be used in the immediate equipment of the road.

PERSONAL.

Prof. George Forbes left New York for England on the "Paris" last Saturday.

Mr. T. W. Sprague, of the mining department of the General Electric Company, Boston, was in New York last week.

Mr. Sheehan has been appointed general advertising agent of the West Shore Railroad, with headquarters at No. 5 Vanderbilt avenue, New York.

The Italian Minister of Public Instruction has nominated the president of the Royal Society, Lord Kelvin, better known as Sir William Thomson, who was created a peer in 1892, to be a member of the Naples Academy.

Gen. E. S. Greeley, president of the E. S. Greeley & Company, of this city, returned to New York this week after an extended trip through the West, during which he winessed the opening ceremonies of the World's Fair.

Mr. Charles L. Buckingham, the well known patent lawyer of this city, who has been prominently connected with most of the large electrical enterprises of the day, forms the subject of a very interesting biographical sketch in the *Financial Record* for May 3.

Mr. H. L. Storke, for 10 years secretary and treasurer of the Hudson River Telephone Company, Albany, N. Y., resigned on the first of May and will devote more time in future to his personal interests. Mr. Storke will remain as a director of the company and member of the executive committee.

Captain E. L. Zalinski, U. S. A., has returned from an extended sojourn in Europe, and, we are pleased to state, is much improved in health. While abroad the Captain spent a great deal of time with the officers of the Royal Italian navy, and was very courteously received by his fellow-officers of all the countries visited, where much interest exists in his dynamite gun.

Mr. Harold Binney has taken over for the present the law practice of Mr. Gilbert M. Plympton, the well known patent attorney of this city, and has opened offices at 38 Park Row, New York, where he will continue his practice as patent solicitor and expert and as attorney-at-law and counsellor in all matters arising under the laws of patents, designs, copyrights and trade-marks, American and foreign.

Mr. C. O. Baker, Jr., and wife, since Mr. Baker's return from Europe, have removed to the Hotel Jefferson, Fifteenth street and Union Square, New York, a hotel that was widely known to electrical people as the Hotel Dam. It was in this hotel that the Electric Club first had its headquarters and held many of its meetings. Mr. John Chatfield, the new proprietor, is an experienced hotel manager and will add to the fame of this popular fire-proof hotel.

Development of Arc Light Carbons.

It was not so very long ago that in the manufacture of arc light carbons at least 95 per cent. of the rods came from the furnace unfit for use. By improvements in metallic coating the life has been lengthened. Coring has been resorted to, and an almost perfect commercial product has been the result. A carbon manufactured five years ago would make a poor showing if tested in comparison with one of the present day, so that now the question resolves itself into, Can a great improvement be made, or are we near the goal?

Inventors are producing lamps holding very thin carbons, burning in an atmosphere of carbon dioxide. A lamp of recent manufacture has given results even beyond the expectations of the inventor, which is saying a great deal, and now we are daily expecting some new and useful improvement in the production of American carbons to discount those of foreign make and to do away with the cumbersome double arc lamp.

Municipal Ownership of Street Lighting Plants.

(From Paving and Municipal Engineering.)

A committee, composed of N. B. Acheson, Edward McGinnis, H. B. Chase, George Welsch, J. L. Botsford, Peter Deibel and J. W. Dickey, was appointed recently by the common council of Youngstown, O., to investigate the municipal ownership of electric street lighting plants in cities of about the population of Youngstown. The committee did its work thoroughly and made a valuable report. From the information gathered a very comprehensive table was compiled of which the accompanying exhibit is the most essential part.

In submitting the report the committee said:

"We find that there are at least 120 cities in the United States that own their own the plants and furnish the street lights without cost to their taxpayers, which is certainly a splendid showing.

"We find the prices in other cities varies from seven dollars for each arc street lamp per year all the way up to and more than is paid in this city, but at the same time we find the price varies nearly in proportion to the price of fuel in those cities, and as coal for our water works is furnished at about one dollar and ten cents per ton, we believe that we are favorably situated to get cheap and efficient lighting service.

"The street arc lights for this city cost $67.50 per lamp per year, and we now have 237 of them, and at this price—which is considered very low for a private corporation to furnish—amounts to $15,997.50, and, in addition to these, there are 389 vapor lights costing $14 each per year, or nearly $5,446, which, added to the cost of the arc lights, makes a total of $21,443.50, or about one-sixth of the whole amount received from taxes for municipal purposes that is paid for street lighting alone. * * *

"When this city owns and operates an incandescent plant with the arc light plant, it would, as other cities do, derive profit enough to nearly, if not entirely, pay for the cost of running such an institution, as well as the interest on the necessary bonds for its purchase or erection, and get the street lights for little or nothing.

"One thing is certain, there would be no combination or tacit understanding between the city and the gas company as to who should occupy this or that street, and the price and quality of gas would be more satisfactorily regulated by competition than all of the legislation that could be made would accomplish. We believe that the city should issue its bonds for this purpose, and the control of these plants should be placed in the hands of the water-works trustees.

"We, therefore, recommend that the necessary steps be taken to procure legislation enabling this city to issue its bonds in an amount not exceeding $100,000, at not more than six per cent. interest, for the purpose of erecting or purchasing, owning and operating an arc and incandescent electric lighting plant for street and commercial purposes."

The council decided to submit the question to a vote of the people.

Mayor Pingree, of Detroit, is an advocate of municipal ownership of street lighting, and has had three estimates on the cost and operation of a plant in that city prepared for the consideration of the Detroit council. The estimates are as follows:

Estimate No. 1.

For 2,000 arc light plant complete, with fire-proof building, direct coupled engines and dynamos:

Real estate and building	$35,800 00
Boilers and appurtenances	44,000 00
Engines and connections	58,000 00
Dynamos and station electrical appliances	70,000 00
Contingent, 5 per cent	10,090 00
Total cost of station	$217,890 00

Cost of maintaining lamps and lines per year, 2,000 lights:

Trimmers, repairers and underground conduit men, 35, at $2 per day	$25,550 00
2,000 pairs of carbons, per day	14,600 00
Repairs and depreciation on lamps, lines and converters, at 3 per cent	6,900 00
Repairs and depreciation on conduit system, at 3 per cent	2,400 00
Interest on lines, lamps, conduit system, etc., at 4 per cent	12,800 00
	$62,250 00
Cost per lamp per year for line and lamp maintenance	$31 12
Total cost per year	$124,174 00

Total cost per lamp per year:

Expense of commissioner's office per lamp per year	$3 00
Cost of power delivered to line per year	27 97
Cost of lamp and line maintenance per yr	31 12
	$62 00

Estimate No. 2.

Cost of plant, as per Estimate No. 1 ..... $537,890 00

Cost of operation and maintenance per year, based on moonlight schedule of 1893; calculated on plant to start one-half hour after sunset and one hour before moonset, and to stop one hour after moonrise and one hour before sunrise.

Hours of station operation:

	H.	M.
January	206	10
February	198	40
March	175	40
April	153	50
May	144	10
June	137	50
July	152	00
August	164	20
September	180	20
October	212	10
November	219	00
December	244	20
	2,183	30

Total cost per year:

Expense of commissioner's office	$6,000 00
Cost of power	42,627 00
Cost of lamps and line maintenance	54,930 00
	$103,557 00

Total cost per lamp per year:

Expense of commissioner's office	$3 00
Cost of power per lamp per year	21 31
Cost of lamp and line maintenance	27 46
	$51 77

Lamps, lines, etc.:

Distributing converters	$30,000 00
2,000 arc lamps	60,000 00
2,000 iron poles or mast arms, complete, at $20	40,000 00
500 miles of pole line, $200 per mile	100,000 00
20 miles of conduit system, including copper wire, complete	80,000 00
Contingencies	10,000 00
	$320,000 00
Total investment	$537,890 00

Cost of operation and maintenance per year, station to run 12 hours per day at 2,000 horse-power:

Office expenses	$6,000 00
Power plant employés	11,540 00
Fuel and maintenance	24,090 00
Repairs and depreciation of power plant, at 5 per cent. on $172,800	8,640 00
On building, at 2½ per cent	600 00
Oil, waste and supplies	3,000 00
Interest on station and power plant, 4 per cent. on $301,800	8,072 00
	$61,942 00
Cost per horse-power per year delivered to line	$27 97

Electric Lighting Plants Owned by Cities.

Name of Town.	System in Use.	Number of Arc Lights.	Candle-Power.	Is plant operated in connection with other works?	Fuel Used.	Cost.	Cost of the Plant.	Incandescent Lights for Private Use.	Charge for them.	No. in Use.	Arc Lights Cost the City each per Year.	Was city furnished electric light by private corporation previous to owning its own plant?	What did you pay per light for same?	Do your citizens believe it wise for the city to own the plant?
Atlantic, Iowa	Slattery			No	Coal	$1 35	$25,000 00	Yes		1,500		No		*
Albany, Mo	Westinghouse	30	1,200	"	Wood	2 00	11,000 00	"	*	1,000	Nothing	"		Yes
Alexandria, Va	Schuyler	92	1,500	Yes	Coal	3 07	16,000 00	No			$55 00	"		"
Alexandria, Minn	T.-H.	10	1,200	"	Wood	2 00	6,000 00	Yes	65c	over 600	about 7 00	Yes	$120 00	"
Arlington, Minn	Edison	4	1,200	"	"		28,000 00	"	75c	100	200 00	No		
Ashtabula, Ohio	Westinghouse	120	500-2	No	Coal	2 90	25,000 00	"	50c	600	77 00	Yes	76 00	Yes
Attalla, Ala	West'n & Nat'l	25	2,000	Yes	"	1 65	10,000 00	"	70c	150	80 00	No		"
Aurora, Ill	G. El. Co. & W'n	162	2,000	"	"	1 81	41,800 00	No			58 44	Yes	326 92	"
Bay City, Mich	Ft. Wayne El. Co.	180	2,000	No	Shavings	per year 1,750 00	30,000 00	"			46 00	"	100 00	"
Bluffton, Ind	T.-H.	85	2,000	"	Natural Gas	100 00	10,500 00	"			60 00	"	75 00	*
Bloomington, Ill	T.-H.	220	2,000	Yes	Coal	1 75	73,000 00				50 00	"	111 00	Yes
Clarion, Iowa	Incandescent			No	"	2 30	8,000 00	Yes	*	700		No		"
Chariton, Iowa				"	"	1 20	22,000 00	"	Aver. 50c	1,200		"		*
Chambersburg, Pa	T.-H.	72	2,000	Yes	"	3 00	20,000 00	No			78 00	"		Yes
Coldwater, Mich	T.-H. and W'rn	70	2,000	"	Oil	100 gal. 1 72		Yes		2,300	less th'n 60 00	Yes	25c. per n't	"
Council Grove, Kan	T.-H. and W'rn	29	1,200	"	"	3 60	8,000 00	"	*	43	75 00	No		"
Crawfordsville, Ind	W'rn Arc & N'l	141	2,000	No	Natural Gas	2,400 00	70,000 00	"	40c	2,100	25 50	Yes	71 42	"
Crete, Neb	T.-H.	50	1,200	"	Water	100 incad.	8,000 00	No			Nothing	No		"
Chehalis, Wash	Edison	30	2,000	Yes	Wood & Sawdust	Wood 1 59	10,000 00	Yes	*	440	8 00	"		"
Dunkirk, N. Y	W'rn El. Co.	75	2,000	"							41 43			"
Emmans, Pa	West'ghouse Alt.	12	2,000	No	Coal	2 50	3,000 00	No			48 00	No		"
Easton, Pa	W'rn El. Co.	108	2,000	"	"	2 85	30,000 00	"			81 44	"		"
Fairfield, Iowa	Brush	14	2,000	Yes	"	2 30	6,000 00	"			72 00	Yes	150 00	"
Fredonia, N. Y	Ft. Wayne	57	2,000	No	"	2 15	13,000 00	"			36 00	No		"
Gainsville, Ga	T.-H.	50	1,200	Yes	Wood	1 50	10,000 00	Yes	*	35		Yes	75 00	"
Galion, Ohio	Ft. W. Jenney	72	2,000	No	Oil	per gal. 16 10	30,000 00	"	50c	850	65 00	No		"
Grand Ledge, Mich	Jenney	15		"	Coal	*	6,000 00	No	$60		60 00	"		"
Hannibal, Mo	Wood Arc	100	2,000	"	"	2 00	20,000 00	Yes	50 to 75c	2,000	60 00	"		"
Herrington, Kan	T.-H.	28	1,200	Yes	"	2 00	29,000 00	"	75c	620	Nothing	Yes	100 00	"
Herkimer, N. Y	Edison	50	2,000	"	"	2 68	14,000 00	No			50 00	No		"
High Point, N. C	Am. El. Co.	32		No	Wood	2 00	6,000 00	Yes	50 to 75c	100		"		"
Huntington, Ind	Ft. Wayne Jenney		2,000	"	Gas	per year 800 00	15,000 00	No			55 00	"		"
Jamestown, N. Y	Wood	137	1,200				28,000 00				43 92			"
Leon, Iowa	Edison			No	Coal	1 85		Yes	*	500				*
Luverne, Minn	W'rn A & W'gh	40	2,000	Yes	"	3 35	*	"	50c	455		No		Yes
Londonville, O	Wood	40	2,000	No	"	2 50	18,000 00	"	*	725		"		"
Little Rock, Ark	Ft. Wayne	195	2,000	"	"	3 15	39,700 00	No			69 83	"		*
Lewistown, Me	Wood	100	2,000	"	Water Power		16,000 00	"			43 00	Yes	109 00	Yes
Marietta, O	Wood & Indpls	110	2,000	"	Coal	1 25	18,000 00	"			60 00	No		"
Montesano, Wash	Westinghouse			"	Wood	2 25	6,324 75	Yes	$1 25			"		Yes
Madison, N. J	T.-H. Alt.	30		Yes	Coal		20,000 00	"	10	600		"		"
Marshalltown, Ia	" "	65	1,200	"	"	1 25	12,000 00	No			*	Yes	100 00	"
Madison, Ga	" "	40	2,000	No	"	2 00	22,000 00	Yes	*	175	80 00	No		*
Madison, Ind	Jenney	86	2,000	"	"	1 49	20,000 00	No			62 00	"		Yes
Marquette, Mich	Brush & West'ghs	100	2,000	"	Water Power		70,000 00	Yes	*	2,700	40 00	"		"
Middletown, Pa	Wood, T.-H.	51	2,000	"	Coal	1 95	25,000 00	"	*	500	Nothing	"		"
Michigan City, Ind	Jenney	50	2,000	Yes	"		10,000 00	No	*			"		*
Miamisburg, O	T.-H.	46	2,000	No	"	1 75	12,000 00	Yes	*	800	52 00	"		* Yes
Martinsville, Ind	Ft. W. J'y & B. Eng.	30	2,000	Yes	"	*	5,000 00	No			33 00	"		
Metropolis, Ill	Ft. Wayne	30	2,000	No	"	1 15	6,000 00	Yes	*	300				
Oxford, O	Westinghouse	36					20,400 00	"	½c. meter	1,800	*Nothing			*
Peabody, Mass	Edison & T.-H.		1,200		Coal	1 20	50,000 00	*			91 35			*
Peru, Ill	Edison			Yes	"	*	20,000 00	Yes	60c to $1	650		Yes	*	Yes
Painesville, O	Western	70	2,000	No	"	2 10	12,000 00	No			43 60	"	72 00	"
Paris, Ill	Ft. Wayne	90	2,500	Yes	"	*	10,000 00	"			23 00	No		"
Rock Port, Mo	Edison			"	"		6,000 00	Yes	50, 60, 70 & 75c	406	*	"		"
St. Charles, Ill	T.-H. and Ft. W.	150	32 c.p.	No	"	2 50	9,000 00				*12 00 in l'ts			"
Shelbine, Mo	Royal	*		"	"	2 00	7,000 00	Yes	10 L 50	310		No		
Stuart, Iowa	Hawkeye			"	"	1 75	15,000 00	"	*	1,300		"		Yes
St. Peter, Minn	T.-H.	45	2,000	Yes	"	*	17,000 00	"	50 to 65c	675	*	d't no		"
St. Clairsville, O	Westinghouse	30	2,000	No	"		10,000 00	"	*	400	33 65	No		
So. Norwalk, Conn	Western	90	2,000	"	"	3 75	*22,500 00	*				Yes	*	
Shelby, O	T.-H.	44	2,000	"	"	*	19,600 00	Yes	30 to 55c	725	56 00	No		
Schuyler, Neb	Edison	10	2,000	Yes	"	25	7,500 00	"	40 to 50c	600		"		Yes
Savannah, Mo	T.-H.	25	1,200	No	"	1 60	12,000 00	"	35 to 50c	450	*72 00			"
Santa Cruz, Col	Brush	74	1,200	Yes	Wood	3 50		No			50 00	No		"
Tecumseh, Neb	Edison			"	Coal	2 15	5,000 00	Yes	*	485		"		"
Tipton, Ia	Brush, Edison	4	2,000	"	"	3 85		"	50c	200	75 00	Yes	166 66	No
Webster City, Ia	Mather			"	"	1 65	24,000 00	"	*	2,100		No		Yes
Wilton Junction, Ia	Edison			"	"	2 15	7,000 00	"	35c	450		"		"
West Troy, N. Y	Edison, Ball	90		No	"	3 00	22,000 00	No			60 00	Yes	70 00	"
Wheeling, W. Va	Wood	400	42,000	Yes	"	4½c. per bushel	100,000 00	"			50 00	No		"
Wytheville, Va	Edison & Sperry	25	1,200	No	"	2 75		Yes	*	300		"		"

A saving of $20,640 per year in cost of operation over Estimate No. 1.

ESTIMATE No. 3.

For 2,000 arc light plant complete, with fire-proof building, engines, driving countershaft, belted dynamos:

Real estate and buildings	$45,000 00
Boilers and appurtenances	72,000 00
Dynamos and station electrical ap'li'nces	65,000 00
Contingent	11,400 00
Poles, lines, etc.	47,000 00
Total cost of station	$240,400 00
Lamps, lines, etc.	300,000 00
Cost of operation and maintenance per year, station to run 12 hours per day	66,255 00
Cost of horse-power per year delivered to line	33 12
Cost of maintaining lamps and lines	60,450 00
Cost per lamp per year	30 22
Total cost per year:	
Expense of commissioner's office, per yr	$6,000 00
Cost of 2,000 horse-power, per year	66,255 00
Cost of m'nt'ning lamps and lines, pr yr	60,450 00
	$132,705 00
Cost per lamp per year	$66 33

Operated under the moonlight schedule, as per Estimate No. 2, the cost of maintenance per lamp per year will be $56.

New England Telephone and Telegraph Company.

The stockholders of the New England Telephone and Telegraph Company, at their annual meeting in New York on May 1, cut their board of directors down from 17 to 12, because of a change in New York law (which now only requires two New York men on board), and elected the following by vote of 78,858 shares: Frederick Ayer, John H. Cahill, Benjamin C. Dean, William H. Elliott, William H. Forbes, John E. Hudson, Henry S. Hyde, Albert O. Morgan, David B. Parker, Moses G. Parker, Stephen Salisbury, Thomas Sherwin.

The annual report for the year ending December 31, 1892, compares:

	1892.	1891.	1890.	1889.
Gross,	$1,801,567	$1,559,345	$1,383,667	$1,255,570
Expenses,	1,365,123	1,189,732	1,045,037	927,305
Net,	436,444	369,623	338,630	296,265
Dividends,	355,736	338,630	268,265	270,726
Surplus,	80,716	30,992	40,365	27,539

In six years the number of telephone stations has increased from 16,000 to 24,000, the employés from 500 to 1,000 and the connections from 18,800,000 to 46,000,000 per year.

Substantial progress has been made in the extension of the underground system. The company has now 8,281 miles of underground wire in Boston. Increase in number of stations during the year 1,015, against 1,028 the previous year.

Electric Locomotive for the Chemin de Fer du Nord in France.

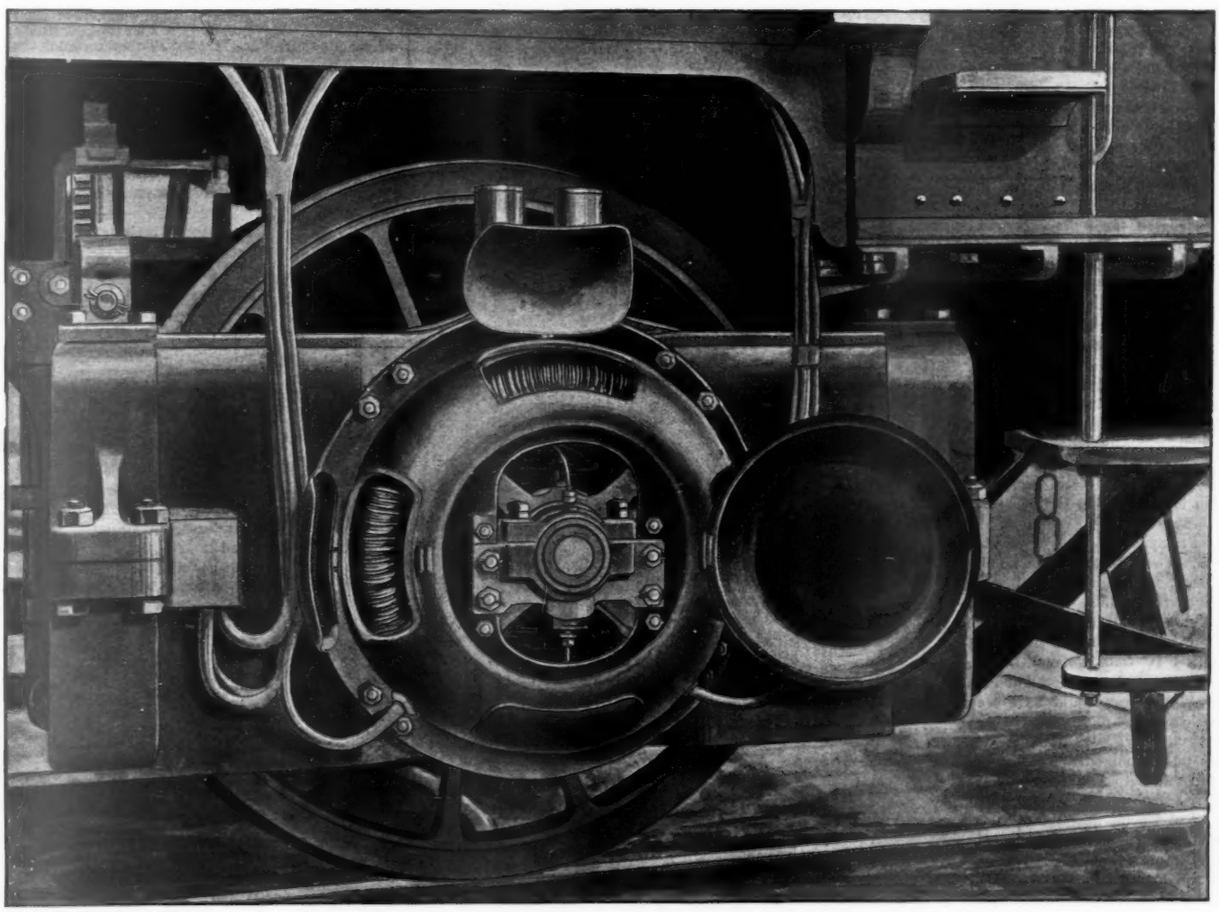
The Northern Railroad, of France, some time ago decided to make experiments with an electric locomotive adapted especially to the working of its local and suburban trains. The problem presented was to provide a machine which would be able to work a train properly under different conditions of grades and curvature, and the necessity of making frequent stops; which would be able to maintain a nearly uniform speed and to increase the commercial speed of trains without the necessity of using very high speeds on descending grades and at other favorable points. The type of locomotive adopted after careful study is an experimental one only and may be modified after trial; but it has been carefully worked out and presents some interesting points.

The locomotive is simple in construction. It is a car or carriage mounted on six wheels of equal size. Two of the axles carry motors, the third being only a bearing axle. The car serves as a platform to carry the storage batteries which supply power, leaving room for the engine driver, the reversing levers and other machinery. These storage batteries are of the type made by the Societe du Travail Electrique des Metaux, and are made up of elements consisting of 11 plates 800x400 mm. in size and 6 mm. thick. There are 80 of these elements on the locomotive, and as each weighs 143 kg., the total is 11,440 kg. The weight, including all the boxes and connections, is 19 metric tons. The arrangement of these storage batteries, the suspension of the plates, their composition and other points have been carefully studied out. It is calculated that without renewal they will supply power to the locomotive for 6½ hours of constant running at a speed of 46 km. an hour, or for a run of 300 km., or about 184 miles. The connections are so arranged that at the option of the engineer combinations giving 40, 80 or 160 volts may be made, to increase the speed, to give the additional power needed on grades, or to start the engine. The action of the motors may be reversed instantly, and they may be used as powerful brakes to stop the train.

An accessory arrangement permits the motors to be used as generators when the engine is running on down grades, thus restoring to the accumulators part of the power which has been expended.

The arrangement of the motors is somewhat peculiar. The journal bearings on the axles are inside the wheels, and the motors are placed outside the wheels on the ends of the axles, which are made long enough for this purpose. The arrangement is shown in the accompanying engraving, kindly loaned by the *Engineering and Mining Journal*, which is from "Le Genie Civile." Two reasons are given for this arrangement, first that the motor is much more accessible for inspection and repair; and second that the motor can be suspended from the frame of the engine by links connected with the outside sills, thereby relieving the axle of the dead weight of the motor, which in the usual plan of construction comes directly on the rails without the intervention of springs. A very serious objection to the electric motor has been, in fact, this dead weight, which is usually destructive to the rails. The motor has for protection against injury by dust or other causes a zinc box or case around it. In the engraving the cover of this case is shown open. The motors, which were built by the Bregnet works, are four in number, two on each driving axle; they are of the four-pole type, which was adopted because with this type a high magnetic speed can be obtained with a comparatively low angular velocity.

So far this locomotive has worked with satisfaction to its designers; the tests, however, have hardly begun, and no report will be made until they have been continued long enough to satisfy the company as to the work for which this motor is adapted and the place which it can properly and economically fill in the service of the road.



ELECTRIC LOCOMOTIVE FOR THE CHEMIN DE FER DU NORD.

The New York and Pennsylvania Telephone Company has commenced the construction of a long distance line from Jamestown to Elmira, *via* Salamanca, Olean and Wellsville, New York. A branch will be run from Carrollton to Bradford.

LITERARY.

The issue of London *Engineering* for April 21 is a most remarkable and progressive technical publication, containing 150 pages of interesting and well illustrated descriptive matter relating to the new Cunard ships, the World's Fair, the New York Central Railroad and the Pennsylvania Railroad.

The annual catalogue for 1892-3 of the Massachusetts Institute of Technology shows that 1,060 students are pursuing regular courses at this technical college. The electrical engineers graduated from year to year by this institution have, as a rule, fully sustained the reputation of their *alma mater*, and we have no hesitation in recommending the M. I. T. as one of the very best training schools for electrical engineers in this or any other country.

"Facts and Figures Interesting to Electric Railroad Men" is the title of a valuable little brochure by Charles Henry Davis, C. E., consulting and constructing civil and electrical engineer. Tables of cost of electric railway elements and construction are given in handy form. While the figures and statements made are taken from general averages, and are given as possible attainments under average conditions, they do not necessarily apply to any particular case. Mr. Davis is an engineer of considerable experience in electric railway work, and his little brochure should be valuable to those contemplating electric railway construction. We infer that the book will be sent to any one who may address Mr. Davis at 120 Broadway, New York city.

"The Standard Electrical Dictionary, a Popular Dictionary of Words and Terms Used in the Practice of Electric Engineering," by T. O'Connor Sloane, published by N. W. Henley & Company, of New York. Price, $3, supplied by ELECTRICAL REVIEW, 13 Park Row, New York. The features of this dictionary are the simplicity with which the definitions are prepared, the numerous cross-references and the thorough index. The explanations are short, some of them are, perhaps, too short, but in this collection the elimination of all unessential material is a matter which has permitted of a display of judgment such as results from practical and actual association and familiarity with the subject matter in hand. It is the popularizing which in this case gives the value to the book.

Wall Street and the Electrical Stock Market.

The panic of this week from which, at this writing, Wall street has hardly begun to recover, in the belief of old-timers, was one of the worst in history. The events of the financial world which led up to it are too well understood to require reiteration here. The beginning of the end occurred two weeks ago, when Secretary Carlisle promulgated his order discriminating against treasury notes, which, if allowed to go into effect, would have put gold to a premium. This completely destroyed what little public confidence remained, and capitalists began to hoard money. This lightened the circulating medium and caused embarrassment to business interests throughout the country. In turn this created a call for accommodation upon the banks which they were either unwilling or unable to grant. Wall street started in on Monday to discount the situation with so great success that it overreached itself, precipitating a panic. Values were depressed Monday and Tuesday, National Cordage leading with serious breaks. On Wednesday the decline in Cordage common had amounted to 30 points. It was at this time that the weakness of Henry Allen & Company was rumored. It was known that this house had accounts of the Cordage officers, who were known to be heavy speculators in the stock. The failure of the house on Thursday was accompanied by the statement that it was caused by the advance of some $250,000 in credit to these officials after their margins had been exhausted. The failure of B. F. Smythe followed, the cause being substantially the same. These two failures caused the selling of stocks held and the closing of outstanding contracts. There was no market, and the forced sale caused a large drop in the entire list. The decline in Cordage common was from 57 to 15; preferred, 101 to 41; General Electric, 97⅞ to 58; and Western Union from 88½ to 80.

Meanwhile well grounded suspicion was entertained of weakness in other quarters. Bankers felt as if they were treading over a powder magazine. Any moment half a dozen of the strongest houses in the Street were liable to suspend. Every indication pointed to an inevitable and terrible crash. Upon the failure of S. V. White on the morning of Friday it was thought that the end was near. There seemed to be no bottom to the decline. Large blocks of stock were thrown over regardless of prices. The suspected houses stood trembling in the balance. But for the timely assistance of such capitalists as Gen. Thomas, Drexel, Morgan & Company, George Gould and the Vanderbilts, Wall street would have been subjected to a crash that could not have been paralleled in history. When it became known that this strong outside report had been rendered and that all imminent danger was passed, a sharp rally took place which carried stocks to a point near the opening.

To-day's inventory of the battle field showed many wounded, but a general purification of the blood, and an altogether healthier atmosphere. Confidence is by no means restored, neither has danger of additional and heavy failures passed. However, it is believed that the worst is over. The recovery will be a slow and painful process and it will be a good many months before losses are restored.

This collapse, which was for the most part in the industrial securities, is sure to revive interest and trading in railroad stocks. An encouraging sign is a heavy buying movement from Europe which set in. This reduced sterling exchange one cent and indefinitely postponed gold exports.

ELECTRICAL STOCK MARKET.

Every word of the preceding has a direct bearing upon the electrical securities and but few additional causes were detected to account for their decline.

The campaign in General Electric was the most savage. In addition to the throwing over of the stock the bears brought to bear the arguments of an incomplete annual report. The pronounced nature of the decline was in a measure due to the belief that the company needed money with which to conduct its business, and that in a time of tight money, such as ruled during the week, adequate sums for this purpose would be very difficult to obtain. Throughout the decline the officers of the company gave out reassuring statements to the effect that it had no pressing liabilities, had recently paid off $2,000,000 of its indebtedness; that it found collections easy and that its factories were crowded with work. The rumor that the company contemplated an issue of preferred stock was emphatically denied. The borrowing demand for the stock was good throughout the week, and it is believed that there is a considerable short interest. John S. Wise, counsel for the company, gave out the statement that the quick assets on January 31 were as follows: Cash, $3,871,033; notes and accounts receivable, $12,230,829 making $16,101,863; against which there is a total indebtedness of notes and accounts payable, including dividends and accrued interest on debenture bonds, amounting to $5,246,219, showing a difference in these items of quick assets of $10,855,644. The company has inventories, work in progress and stock and bonds, at a valuation said to be conservative, in excess of $34,000,000, as shown in detail in the annual report. It is announced by Mr. Wise that the volume of the company's business is greater and its cash sales much larger than ever before. The debenture bonds of the company sympathized with the capital stock, going to 85 on Friday.

Western Union's lowest point was 80½ from which it rallied to 86 to-day. There is no cause for the decline other than the general situation. The other active stocks of the electric list also declined on Thursday and Friday and rallied to-day.

The annual report of the New England Telephone Company shows:

Year.	1892.	1891.	Inc.
Gross earnings	$1,801,567	$1,559,345	$242,222
Exps. and charges	1,365,123	1,189,722	175,401
Net	$436,444	$369,622	$66,822
Dividends	355,726	338,630	17,096
Surplus	$80,718	$30,992	$49,726

Ledger balances Dec. 31, 1892, were:

DEBTORS.

Property and franchises Jan. 1, 1892	$11,963,576
Construction for year 1892	338,129
Supply department	180,237
Real estate	25,219
Stocks and bonds	30,000
Trustee stock	231,000
Accounts receivable	337,000
Cash	76,988
Total	$13,218,155

CREDITORS.

Capital stock	$10,394,600
Surplus	387,572
Income account	278,943
Bonded debt	1,775,000
Debt, accounts payable	53,506
Reserve	328,533
Total	$13,218,155
Net gain private line subscribers 1892	165
Net gain of exchange subscribers 1892	1,145

Following is given the fluctuations of the active stocks, together with the bid and asked price on the close to-day:

	H'g'st.	L'w'st.	Bid.	Asked.
Western Union	88½	80⅛	85¼	85¾
General Electric	97⅞	58	81⅛	83
Edison El. Ill., N. Y.	119¾	110	115⅛	117⅛
American District Tel.	59	55	....	57
American Tel. & Cable	88	84	80	85

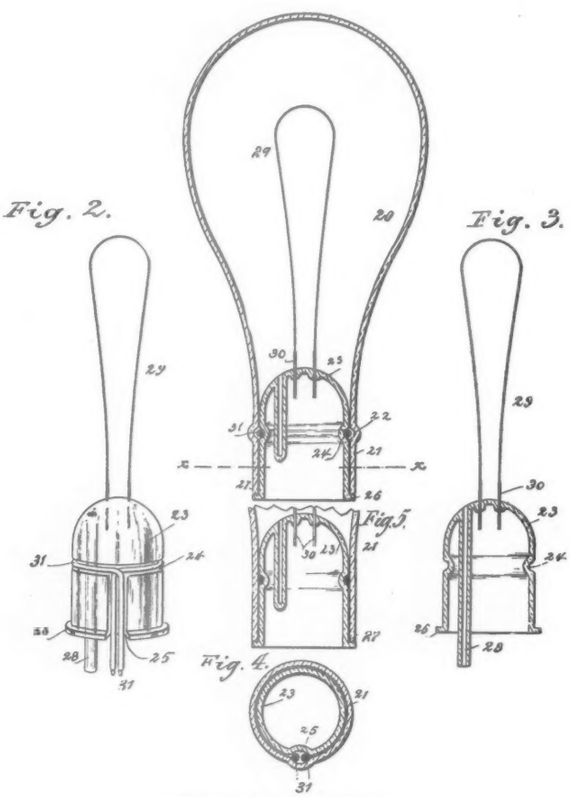
New York, May 6.

Striking Linemen.

The linemen of the New York and New Jersey Telephone Company, Brooklyn, have struck for $3 a day, an increase from $2.50. The telephone inspectors, who received $2 a day, struck, also, on Monday of this week, for $2.50. It is estimated that about 30 men have struck, and there is a possibility of the strike extending to other parts of the company's territory outside of Brooklyn. The men employed by the trolley roads of Brooklyn are also asking for increased pay.

As yet no serious difficulty has resulted, and all the companies concerned state that they will have no difficulty in filling the vacant places if the men stay out.

Fig. 1.



BENJAMIN'S STOPPER LAMP.

The Benjamin Stopper Lamp.

It is always interesting to watch the progress of an invention. Nothing is made perfect at the beginning; at the end either for that matter, and the incandescent lamp seems to be no exception to this rule. The one feature at the present time, which in a very small way is a disadvantage with the Edison lamp, is its cost. Although we might here mention that nothing in the world except air and water is free from this disadvantage, nevertheless the introduction of the genus "separable glass stopper lamp" first devised by Maxim, Fox, Böhm, and many others, has risen into popular fancy, and with Oliver Twist-like pertinacity they cry for more. Modifying old Commodore Vanderbilt's saying into "The public be satisfied" the inventors have continued to invent. Mr. George H. Benjamin, of this city, has received a patent for an incandescent lamp and has assigned it to Siemens & Halske, of Berlin. The improvement consists, as shown in Fig. (2), of the separable stopper ground to fit the neck of the lamp, though the retention of the enclosed vacuum is not dependent on the perfection of the fitting, but on the annular seal produced in the following ingenious manner. It will be seen from the accompanying illustrations that both the neck of the lamp and the cartridge-shaped stopper have each a semicircular groove, which register when the stopper is in place. A vertical groove in the stopper, connecting with the annular one, allows for the introduction of an insulated wire which is wrapped around as shown in Fig. (2). Before the wire is put into these grooves they are first covered with a paste, such as the cement used for joining carbon filaments to leading-in wires, which after being heated becomes hard and nonporous. Instead of this composition a fusible amalgam may be used. One which the inventor recommends is composed of lead (nine parts), antimony (two parts), bismuth (one part). The stopper is coated with a thin varnish and inserted, and a current is passed through the wires. The heat thus generated carbonizes the material before mentioned, or melts the amalgam, depending, of course, on which is used. The heat is carried to such a point that the glass is softened and the groove in the neck (22), is compressed as shown in Fig. (5). The air in the lamp is removed through the tube (28) shown before evacuation in Fig. (3), and after sealing in Fig. (1). Mr. Benjamin claims that by this method a perfectly air-tight joint can be obtained.

American Institute of Electrical Engineers.

ANNUAL AND GENERAL MEETING, NEW YORK, MAY 16 AND 17, 1893.

The annual meeting of the Institute for the reception of the yearly reports, the election of officers and other business proceedings, will be held at the headquarters of the Institute, No. 12 West Thirty-first street, at 4 P. M., Tuesday, May 16. It is expected that this session will occupy about two and one-half hours.

After adjournment, those who so desire will assemble at "The Arena," 41 West Thirty-first street, where a subscription dinner will be served, the price of which has been fixed at $2 per plate; wine extra. This will be a purely social gathering, and it is hoped that all who find it convenient will endeavor to attend. Friends may be invited.

The general meeting will be held at the headquarters of the Institute, 12 West Thirty-first street, Wednesday, May 17, 1893.

MORNING SESSION.

The morning session of the general meeting for the reading and discussion of papers and reports will be called to order at 10 o'clock. The following papers will be read:

1. "On the Behavior of Fuse Metals in Direct and Alternate Current Circuits," by Mr. Charles P. Matthews, of Cornell University, Ithaca, N. Y.
2. "A Modified Deprez-D'Arsonval Galvanometer," by Lieut. Charles D. Parkhurst, of Watervliet Arsenal, West Troy, N. Y.
3. "The Variation in Economy of the Steam Engine due to Variation in Load," by Prof. R. C. Carpenter, of Cornell University, Ithaca, N. Y.
4. "An Automatic Printing Speed Counter for Dynamo Shafting," by Prof. George S. Moler, of Cornell University, Ithaca, N. Y.

At 1 P. M. a recess of one hour will be taken and a collation will be served.

The afternoon session will be held at 2 o'clock Wednesday, May 17, 1893.

5. "Practical Aspects of Electrical Resonance," by Dr. M. I. Pupin, of Columbia College, New York City.
6. "The World's Electrical Congress of 1893," discussion of the provisional programme prepared by the Institute committee. This report, with its appendices, has been printed in the January and February issues of the Transactions, and absent members are earnestly invited to contribute in writing any comments they desire to make.
7. "High-Tension Generators for Direct Current Transmission," by Prof. Francis B. Crocker, of Columbia College, New York City.
8. "The Heating of Armatures," by A. H. and C. E. Timmerman, of Cornell University, Ithaca, N. Y.

The arrangement of papers in this programme is subject to change, if found necessary during the progress of the meeting.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

CONCORD, N. H.—It is reported that an absorption of the Concord Electric Street Railway by the Concord Land and Water Company is likely to occur soon. If such a movement is consummated the road will become a powerful auxiliary in the Land and Water Power Company's work of developing the Sewall's Falls water power.

HARRISON, OHIO.—Plans are being formulated whereby a long distance electric railway is to be constructed between Cincinnati and this city. Right of way is being secured rapidly. The parties interested are members of a Boston syndicate.

YOUNGSTOWN, OHIO.—The Youngstown and Canfield Street Railway Company; capital, $65,000. Incorporators, J. W. Canfield, S. O. Ewing, John Delfs, Alexander Dickson and H. M. Osborne, all of Canfield.

SYRACUSE, N. Y.—The State Railroad Commissioners have granted the application of the People's Railway Company to change from horse to electric power.

INDIANAPOLIS, IND.—The City Railway Company; capital, $2,000,000. Incorporators, John W. Murphy, Augustus Kiefer, Frederick Fahnley, John M. Kitchen, George A. Dickson and Henry C. G. Bals.

CHESTER, PA.—A charter has been granted for a new electric railroad which will connect Chester and Media with Rockdale, Glen Riddle and towns in Chester Creek Valley. The officers are: Congressman John B. Robinson, president; Edmund Jones, secretary; Edward H. Price, treasurer, and William Ward, solicitor.

TIFFIN, O.—A number of Tiffin's capitalists have formed a company to construct an electric railway from this city to Bellevue *via* Green Springs and Clyde.

WAUKEGAN, ILL.—Some of the large property owners in the south side factory district will expend $100,000 in building an electric street railway to connect the various factories with outlying subdivisions. The road will be four miles long. C. A. Newcomb, of Detroit, has signed the contract and given bonds to build the road.

CLEVELAND, O.—T. S. Gerhard, of Independence, has applied to the county commissioners for a franchise to build an electric line from Cleveland to Brecksville, Independence and Akron.

GOSHEN, IND.—The Indiana Electric Power Company; capital, $300,000. Incorporators, W. Ralph Wanner, of Goshen; Henry W. Kratz, of Norristown, Pa.; Clinton D. Firiston and G. F. Coleman, of Columbus, O. The company proposes to construct and operate electric street railway lines in Goshen, New Paris and Nappanee, and between Goshen and Elkhart, and between Goshen and Nappanee.

CHICAGO, ILL.—The Chicago Electric Transit Company; capital, $500,000. Incorporators, John Casselman, Henry Wulff and Alonzo H. Hill.

MARTINSVILLE, IND.—The Indianapolis and Martinsville Electric Railway Company; capital, $50,000. Incorporators, Oscar Matthews, H. H. Smock, E. Henderson and E. F. Branch, of Martinsville; M. G. Branch, of Muncie; and J. C. Devore and James Stevenson, of Indianapolis. The length of the road will be about 30 miles.

BRIDGETON, N. J.—The construction of a trolley road between Bridgeton and Millville, a distance of 10 miles, will soon be begun. The road will be built by the Bridgeton and Millville Turnpike Company. The company has been reorganized, the members of the Rapid Transit Company having secured control of the stock. John Smalley, is the new president, and Walter H. Bacon, secretary and treasurer.

MADISONVILLE, OHIO.—The Madisonville and Cincinnati Street Railway Company; capital, $100,000. Incorporators, George W. Losh, C. L. Metz, W. H. Settle, C. M. Settle and James Julien. The company will construct, operate and maintain an electric railway between the two cities.

ELIZABETH, N. J.—The Elizabeth and Plainfield Electric Street Railway Company is an applicant for a franchise to build an electric line in Elizabeth.

ST. JOSEPH, MO.—The St. Joseph Traction and Lighting Company; capital, $1,700,000. Incorporators, Camille Weidenfeld, Wm. Harriman and Stephen S. Palmer, of New York city; James T. Gardiner, of Albany N. Y.; John R. Owens, Robert A. Brown and W. T. Van Brunt, of St. Joseph. The company will bid for the property of the People's Street Railway, Electric Light and Power Company, which will be sold at auction May 16.

AUBURN, N. Y.—The Electric Railway of Auburn; capital, $50,000. Incorporators, G. Underwood and F. E. Storke, of Auburn; Charles E. Eddy, of Newton, Mass.; E. F. Allen, of Medford, Mass; Alexander Beal and E. B. Martin, of Boston.

WASHINGTON, D. C.—L. W. Spear, formerly interested in the Mt. Vernon electric railway, has interested a number of Northern capitalists in a rival road, and surveys have already begun.

NORTH TONAWANDA, N. Y.—Wm. F. Love, of Lewiston, L. R. Sanborn, of Sanborn, and L. F. W. Arend and Dr. Billing, of Buffalo, are interested in the proposed electric railway to connect Sanborn, Pekin, Buffalo, North Tonawanda, Niagara Falls and Lockport.

PHILADELPHIA, PA.—The Frankford, Bridesburg and East Fairmount Park Railway Company; capital, $78,000. Incorporators, George W. Rush, William B. Gill and others, of Philadelphia. The road will be an electric line.

SHELBYVILLE, IND.—The Shelbyville Electric Railway Company has reorganized, with Judge Hord as president, and Scott W. Ray, secretary. Contracts have been made to put in an electric plant.

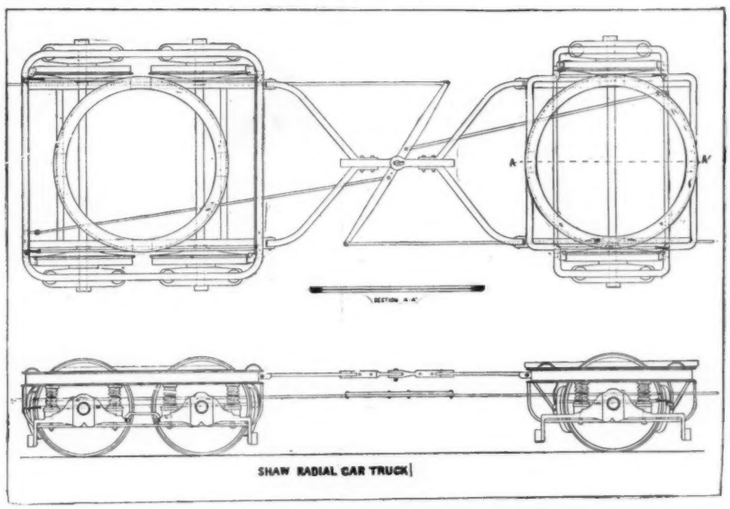
TERRE HAUTE, IND.—The Terre Haute Electric Street Railway will be sold to an Eastern syndicate for half a million dollars. The new company will at once make eight or ten miles of extensions.

JOPLIN, MO.—The Southwest Missouri Electric Railway Company, which is building an electric line connecting Carterville and Webb City with Joplin, is making plans to extend the line to Carthage, Galena, Baxter Springs and Kansas City.

GREEN BAY, WIS.—The Fox River Street Railway Company; capital, $100,000. Incorporators, Jackson I. Case, Thomas S. McCullough and Charles H. Holmes.

COLUMBUS, O.—The Columbus and Harrisburg Electric Street Railway Company has petitioned the board of public works for a franchise.

SAN FRANCISCO, CAL.—J. M. Loucks and C. F. Hayne have a franchise to build a storage battery street railway systems from Mayfield to the Stanford University.



ELEVATION AND PLAN OF THE SHAW RADIAL CAR TRUCK.

New Telephone Companies.

SAN FRANCISCO, CAL.—The Merchants' Telautograph, Telephone and Telegraph Company; capital, $5,000,000. Incorporators, George C. Perkins, J. B. Stetson, John D. Spreckels and C. W. Cross. The company will conduct a general telephone and telegraph business.

OSHKOSH, WIS.—The Oshkosh Telephone and Electric Service Exchange; capital, $50,000. Incorporators, George Bauman, George W. Pratt, R. B. Evans and A. J. Barber. The new company will put into use the automatic switchboard, which does away with the central office and enables a subscriber to connect himself with another without calling the central office.

ST. LOUIS, MO.—The Missouri Pan-Electric Telegraph Company has elected Samuel Kennard, president; Dr. K. Morgner, vice-president; and F. W. Mott, secretary and treasurer. The company intends putting up private wires to commence with and then introducing an exchange system.

Electric Light and Power.

ALBANY, N. Y.—The Municipal Gas Company will increase its capital stock from $1,500,000 to $2,000,000, to enable it to purchase a controlling interest in the Albany Electric Illuminating Company.

DETROIT, MICH.—The Standard Electric Company has increased its capital from $1,000,000 to $3,000,000.

LE MARS, IA.—The Northwestern Water and Light Company; capital, $200,000. Incorporators, J. H. Winchel, Dr. M. W. Richey and J. K. Alline. The new company will acquire the title to the water and electric light plant now owned and operated by J. H. Winchel. The company will also build, equip and operate similar plants in other towns and cities.

WINCHESTER, ILL.—The Winchester Electric Light Company; capital, $14,000. Incorporators, Chas. H. Condit, William Milhaus, William Hinsfurthur and Solomon Hinsfurthur.

SARATOGA SPRINGS, N. Y.—The Delaware and Hudson contemplates putting in an electric light plant to furnish light for its stations and yards in Saratoga Springs.

NORWALK, O.—An order has been issued to J. W. Foster and F. H. Jones, assignees of the Incandescent Light and Power Company, to sell the company's property at public sale. The property is appraised at $35,025.

ISLIP, L. I.—The Suffolk Gas Company has been incorporated to manufacture and supply both gas and electricity. The capital is $200,000, and directors, B. I. H. Trask, I. L. Egbert, of New York city; Charles A. Kittle, of Mt. Kisco, and A. D. Palmer, of East Orange, N. J.

New Manufacturing Companies.

PORTLAND, ORE. — The Crouch Electric Supply Company has been incorporated, with a capital of $100,000, by Samuel L. Lovell, H. J. Singleton and Edmund C. Giltner.

The Shaw Radial Truck.

The Campbell Electrical Supply Company, of Boston, are now the sole agents for the celebrated Shaw radial truck, and are preparing to bring it more forcibly before the public than has heretofore been possible. The accompanying illustration affords a good opportunity to judge of the general construction and operation of the truck, and a number of advantages have been demonstrated for it by severe tests covering several months on one of the largest street railway systems of the country.

It is particularly adapted for the demands of electric traction, especially where long, heavy cars are used, being light in weight, simple in construction, and showing a saving in power on curves and switches of from 20 to 25 per cent. This, it will be readily understood, is an exceedingly important feature, especially on roads using electricity as a motive power, where the load is at all times heavy, and every possible saving in this respect is a matter to be given close attention.

In a series of tests made under a 25-foot car, using the same motor used in testing other trucks, it was found that the average power consumed when the car was fully loaded was from 21 to 22¼ amperes, the former figure representing the power required on straight tracks and the latter on curves and switches.

The remarkable ease with which curves are taken and the perfect alignment made possible by the radial bars may be understood from the fact that at no time was there more than one and a half additional amperes required when rounding a curve over that required on a straight track. Indeed, these figures were taken when the car had been stopped and was started again directly on the curve.

A model of the truck is now on exhibition at the office of the Campbell Electrical Supply Company, 104 High street, Boston, and is well worth inspection by those interested in the economy and consequent success of the electric traction.

KINDRED INTERESTS

George Cutter, of Chicago, is supplying a large batch of the Morris pole tops for the new electric railway at Syracuse, N. Y.

C. E. Lee, late of the Lakeside Building, Chicago, is now at the Lees Building, on Fifth avenue, where he will carry a stock of Samson batteries.

Consolidated Electric Storage Company has removed its offices from 120 Broadway, New York, to the Edison Building, 44 Broad street.

The Armington & Sims Engine Company, Providence, R. I., have issued a most attractive catalogue describing their well known high speed engines which are especially adapted to electric work of all kinds.

The Ansonia Electric Company, of Chicago, make the following important announcement:

We are now ready to take orders for the new "Sunbeam" incandescent lamp, which has been thoroughly tested and will be found entirely satisfactory. At the present time the factory out-put will not permit of the immediate shipment of all orders as fast as they are being received, but manufacturing facilities are being increased as rapidly as possible, and we hope shortly to find ourselves in a position to fill all orders promptly. Prices and further information will be furnished upon application.

Washburn & Moen Manufacturing Company, Worcester, Mass., report an enormous business in their insulated wire department. They have recently secured some of the largest railroad contracts. The company announce that they will soon locate in a large and commodious factory at their South works. This factory will be equipped with most modern machinery. It is their intention to produce nothing but exceptionally high grade wires. The large number of orders which they are daily in receipt of plainly shows the trade appreciate their high grade goods. The rapid progress of this department clearly demonstrates the push and energy of the corporation.

Queen & Company at the World's Fair.

We have received from Philadelphia an attractive pamphlet, "Some Features of the World's Columbian Exposition," issued by Queen & Company, incorporated, from a perusal of which it is evident that the exhibits of this concern cannot fail to prove of interest to all who appreciate high grade apparatus, electrical and otherwise.

To the readers of the ELECTRICAL REVIEW the name "Queen" at once suggests electrical testing instruments, and it may surprise some to learn that while a large department is devoted to such apparatus, it is only one of several others which embrace scientific appliances of almost every description.

Five separate exhibits are made necessary to properly exploit these various branches—one in the Electricity Building and four in the Liberal Arts Building.

Queen & Company will be glad to mail a copy of the above pamphlet to intending visitors, who will find it of much assistance, containing, as it does, general information regarding Chicago and the Fair, and exact particulars as to the location and character of each of their exhibits. Application should be made at once as the supply is limited.

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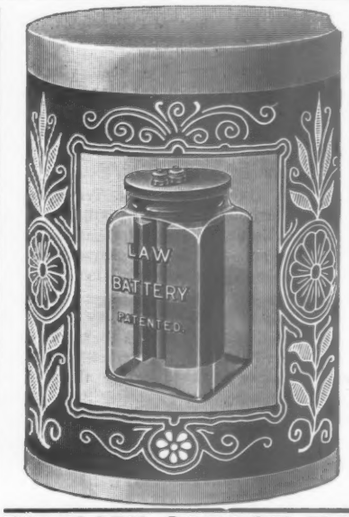

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"In covering the ground which comes most properly under the title, the properties of telephone lines, I have endeavored, so far as possible, to avoid mathematics, and to treat the subject in a way which would prove most interesting and instructive to the general reader as well as to the student. Where it has seemed best to put in a mathematical demonstration, it has been put in a footnote.

"The results of investigations in regard to the properties of telephone lines, I have endeavored to state clearly in a general discussion. They are not susceptible of tabulation, and the most important properties it is impossible to formulate exactly.

"I have treated rather fully the questions of interference with the telephone currents from outside sources, especially the troubles from electric railways; for my practice in that direction, during the last four or five years, has been considerable, and enables me to deal with that subject in the light of personal experience. This question is still of considerable importance in this country, and its treatment here may be of assistance to managers of exchanges in practical work.

"It was my intention that the book should be one which would prove useful to the practical man, as well as that it should serve as a basis for a lecture course to students. I have therefore thought it best to introduce some matter in which correct elementary ideas of matter and energy are developed, so as to lead up to the most modern conception of the method of propagation of electro-magnetic disturbances."

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